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Porte, Roy Trewin

Title:

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printing offices

Place:

Salt Lake City

Date:

1921

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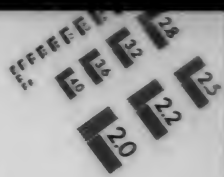
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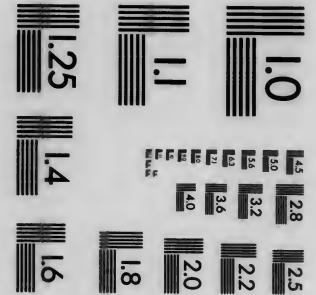
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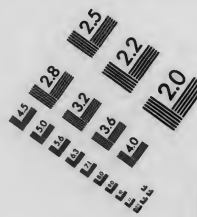
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HOW TO FIGURE COSTS
IN A PRINTING OFFICE

R. T. PORTE



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How to
Figure Costs
in
Printing Offices

HOW TO FIGURE COSTS IN PRINTING OFFICES

By

R. T. PORTE

Author of

"Practical Cost System for Printing Offices"

"The Printers of Chiapolis"

Compiler of

The Franklin Printing Price List

REVISED EDITION



1921

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CONTENTS

Preface	v
Introduction	ix
Factors of cost and profit.....	x
Overhead diagram.....	xii
Figuring the payroll.....	1
Time summary.....	4
Payroll.....	8
Building expenses.....	13
Floor space diagram.....	19
Figuring the inventory.....	25
Plant inventory.....	30
Replacement values.....	37
Depreciation table.....	39
Interest, insurance, taxes expense.....	45
Distributing power.....	57
Plant layout.....	59
Light, toilet, elevator expense.....	71
Department expenses, spoilage, stock handling ...	79
Salaries of foremen and superintendents.....	89
Selling expense.....	97
Administration, commercial investment.....	105
Office expenses.....	113

Answers to questions.....	123
Wages plus overhead.....	124
Outside work.....	130
Newspaper and job plant.....	132
Cost of advertising.....	134
Commercial investment.....	139
Selling hour costs.....	140

PREFACE

There is no claim on the part of the author that all the ideas put forth in this volume are by any means original, nor are they all his own. The main purpose and intent of writing what is given here is to put forward every point that is necessary for the figuring of a cost system according to the methods adopted by the devisers of modern Cost Systems for printing offices, based on chargeable hour methods.

In the years that I have been privileged to do Cost System work, I have felt the necessity of such a book as this for the cost clerk and for printers, telling, not only how the work should be done and why, but showing how by practical examples.

Printers without cost systems have read a great deal of why they should put one in, but rarely how it was to be done. That there are not more cost systems now in use is because

printers generally do not fully understand the actual methods used in the figuring out of a system, and so have hesitated to install a correct system. With this book, and an accurate time keeping system, there should be little difficulty in putting into operation a cost system.

There is always need of expert advice in installing a system, and this book is intended to supply that need. Having put in a cost system, this book will be especially valuable as to the best methods to be used in the figuring of the system, and for the use of the cost clerk.

The arrangement makes it possible to use it as a textbook for classes in costs by organizations. The questions may be given out at the close of the session of the class, and written answers turned in at the next session. This plan can also be used by the individual, and the answers compared with the explanation as given, thus making sure that every point is fully understood.

No doubt many of the ideas here given will

not be accepted as correct by some readers. This is to be expected. Some of the things explained are not the opinions of the author. However, this is not a book of just one system, but of the several systems now in use, and while all are based on the one idea, different methods are often used and some basic propositions in some systems are utterly ignored in others. The reader has here put before him the various methods, and he can easily decide as to which is the best or most practical in his case, and ignore the others, for there is no reason why he should not have a knowledge of all the methods.

The answers to questions in the last part of the volume take up many matters that could not be rightly treated in the cost system for the printing office alone, and they also treat of some exceptional propositions.

Although I have from necessity employed some positive statements, I am very far from laying claim that the last word has been said or that I am the only authority on the subject.

The ideas and arguments, as well as the

examples given, include those of many other authorities and I merely put them into concrete form, and present them in understandable terms to the reader.

I put forth the ideas and examples as given, because they have commended themselves to me, as being the most logical and practical for the purpose intended, as well as the best that are known at this time.

In other words, I have set forth ideas and results—with examples—which I have found to be correct, after a long practical experience in cost system work, and present them to progressive printers for their consideration and use.

R. T. PORTE.

Salt Lake City, Utah.
November 1, 1921.

INTRODUCTION

In order that the items of expense involved in the production of a job of printing may be plainly distinguished, a diagram is printed on the following page to fully illustrate all the items that enter into the cost of a job of printing, and to show the relationship which each item of cost bears to every other item, and also the relation of the whole to the selling price.

It is well worth close study, because of its graphic portrayal of the costs of producing a job of printing in their relative order. It plainly shows each increment of cost added to the job in its progress through the factory and their accumulation into the total cost, profit and selling price.

The Stock of Merchandise group is shown on the right. The guide line shows the direct connection of the job of printing through stock to cost. The smaller squares attached to the stock square give force to the fact that the cost of stock is the price paid plus the handling cost.

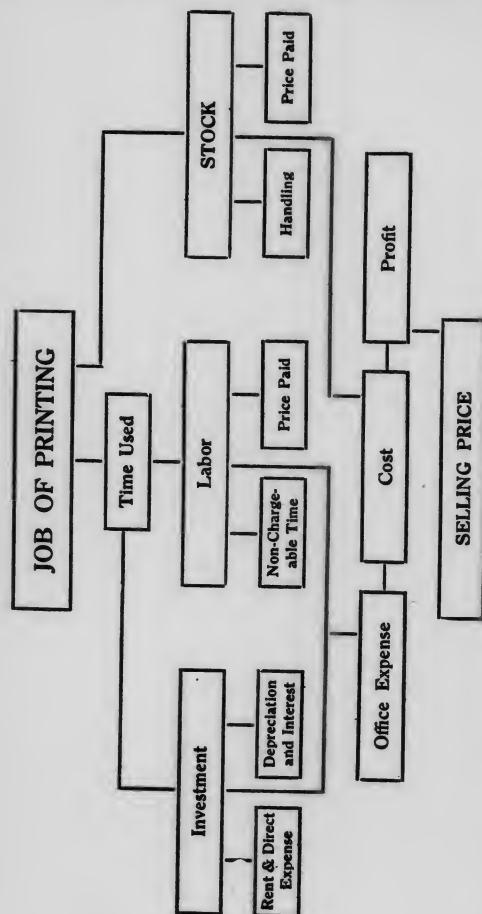


Diagram showing the factors of Cost and Profit in relation to Selling Price as described in this system.

The central group shows the Time Used as the first item of cost, and this is directly connected with labor, showing that labor cost is a burden on the Time Used for the job of printing. Labor cost is made up of the price paid for labor plus the cost of the non-chargeable time as shown in the diagram. The non-chargeable hours in a factory are carried by labor and so add to the cost of the productive labor-hour.

The third group at the left is the Investment group. Investment cost is made up of rent and direct expense plus depreciation and interest. The line from Time Used to Investment indicates that this expense is also a burden on the Time Used. The line running from Investment expense makes up the actual cost of the Time Used on the job of printing.

The short line connecting these two groups with Office expense indicates that to the cost of Time Used must be added an increment of office expense to complete the manufacturing cost. To this cost square the line from the Stock or Merchandise group also leads to complete the cost of the job. To cost is attached the profit, and to profit, the selling price.

This diagram fully illustrates the line of

relationship of all the items which the cost of a job must include, and also the relationship of the cost, the profit and the selling price.

The following diagram shows the typical elements of Burden or Overhead Expense in a printing plant as used in the Practical Cost System for Printing Offices. A study of these expense relations will make clear the general principles involved in the classification and distribution of the various items of Manufacturing Burden or Overhead Expense:

Equipment Charges	Fixed Charges	Productive Center Burden or Overhead	Total Manufacturing Burden or Overhead
Insurance			
Taxes			
Interest on Investment			
Depreciation			
Rent and Heat—Factory	Operating Charges		
Direct Department Expense			
Department Payroll			
Department Supplies			
Repairs to Equipment			
General Factory Supplies			
Non-Productive Labor			
Power	Administrative Burden—Overhead		
Fuel Cost			
Labor Cost			
Power Plant Supplies			
General Superintendence	Administrative Burden—Overhead		
Proprietor's Salary			
Office Payroll			
Estimating Department			
Cost-finding Department			
General Office Expense			

The Total Manufacturing burden is made up of the Productive Center (or shop) burden and the Administrative (or office) burden. The Productive Center burden is made up of the Fixed Charges and the Operating Charges. All these items of the fixed charges are included in the cost of operation of every printing office, however small, as are also all the items of the operating charges except that sub-items under power would not be used in many plants. Under Administrative burden the item of general superintendence would be used only in the largest plants where a superintendent has general supervision not only of the plant but also of the selling and a part, at least, of the business of the office. The item of proprietor's salary should appear in every plant, large or small, although if he works in the shop his salary would appear on the shop pay roll to the amount of his labor in that department. The estimating and cost-finding items may be combined with other office work and so not appear as separate items in the cost charges in medium and small shops, but this work should be considered as a part of the Administrative burden.

HOW TO FIGURE COSTS

I

FIGURING THE PAY ROLL

The first step away from all the old traditions of cost finding was the principle of charging direct to a productive center all of the pay roll of the labor used in that center.

The Cost Systems now used by the printers of America are different from any of the former methods, in that the production center rather than the individual becomes the unit of production. The Accountants' method of ascertaining costs was to obtain only labor costs (actual wages), adding a percentage for "overhead," another for selling, and then a profit.

The productive center method is to figure labor as just one element of cost, and to divide the manufacturing plants into productive centers or units of production, and ascertain the cost per hour in that unit.

The common term for productive center is

"department," but this does not clearly express the writer's idea, and is discarded for that reason. The terms, however, are nearly synonymous.

This is the most efficient method, in that the material or machinery used is the means for using the efficiency of the workman. Their efficiency can be fairly well measured through the productive center records.

To add more "overhead" to a high-priced workman than to a low-priced one is unfair, but is an inevitable result of the percentage methods of accountants. High wages are paid certain employees because they are more efficient and therefore need less supervision. When a man's wages are raised five cents an hour, you cannot say you should add ten cents more for supervision, or that he should stand for more rent, light, power, or what not, because of that increase.

Analyzing the proposition to the fullest, any percentage method based on price paid for labor, gives only unreliable comparisons, and was originally adopted only because no better method was then known. This method, of course, has been defended time and time again by many "high authorities" who have

written able articles, but that was before the day of modern direct methods.

Today we think less of labor costs, and more of "efficiency costs," which the productive center method, boiled down, really is.

The first item the cost clerk figures in the monthly Summary of Costs is the Department Pay Roll. Here, regardless of anything else, the entire pay roll of each employee is divided and charged to each productive center in which he has worked in accordance with the hours as shown in his time record.

The usual productive centers in a printing office are Machine Composing Room, Hand Composing Room, Cylinder Press, with subdivisions according to size, Job Press, Ruling Machine, Cutter, Men's Machine, Men's Handwork, Girls' Machine and Girls' Handwork. Many offices have additional productive centers, according to the nature of the work.

The wages of every employee who works in the composing room must be charged as a lump sum against that productive center, including galley boys, distributors, proof-readers, etc., and this applies just the same to all other productive centers.

In many cases, however, an employee works

DEPARTMENT TIME SUMMARY														MONTH OF		192-	
ENTER DAILY TIME OF EMPLOYEE IN EACH DEPARTMENT WORKED IN																	
EMPLOYEE <u>Charles Edmunds</u>														Hour Rate			
MECH. COMP.		W.D. COMP.		CYLINDER		JAGGERS		BINDERY		STOCK		OFFICE					
Hr.	U.	Hr.	U.	Hr.	U.	Hr.	U.	Hr.	U.	Hr.	U.	Hr.	U.				
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31																	
TOTAL																	
LABOR COST																	

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TOTAL: 54.2 112.8 57.5
LABOR COST: 48.36 90.24 46.00

DEPARTMENT PAY ROLL 7

as many spaces may be used as are necessary.

An Individual Time Division blank, covering seven departments, is illustrated on page 6. This blank is $4\frac{1}{4} \times 8\frac{1}{2}$ inches and can be punched for ring binder or three of these forms may be run on a $14 \times 8\frac{1}{2}$ sheet of same size as blank shown on page 4.

The total number of hours used in each of the centers can be added up at the end of each month, the rate of wages per hour and total multiplied, and actual wages for each center can thus be ascertained.

A Total Departmental Pay Roll blank— $8\frac{1}{2} \times 11$ —as shown on page 8, is a valuable addition to the series of pay roll blanks. On this blank is collated the monthly pay roll amounts for each individual employee in every department in which he has worked during the month as shown by the departmental time blanks. This blank provides space for the total amount of the pay roll of each department, the total chargeable hours for each department which are taken from the record of chargeable and non-chargeable hours.

The labor cost for the chargeable hour is found by dividing the amount of the departmental pay roll by the number of chargeable hours of that department.

TOTAL DEPARTMENTAL PAY ROLL										MONTH OF		1930	
EMPLOYEE	REGULAR	OT	GRAT	COM	IND. A	IND. B	IND. C	IND. D	IND. E	IND. F	IND. G	IND. H	IND. I
John Richards	20.46												
Edna Edwards	43.36	5.02											
R.R. Bracker	24.50												
<i>Signed J. J. Jones - Wm. J. Smith</i>													
TOTAL DEPT. PAY ROLL										478.80		54.36	
TOTAL CHARGEABLE HOURS										243.80		54.32	
LABOR COST - CHG. HOUR										74.58		1.00	
PERCENTAGE NON-PAY TIME										70		25	

10 HOW TO FIGURE COSTS

There will be several employees of such centers and their salaries are added together making up the total pay roll for each of the centers.

The total pay roll cost of the various centers in the sample shown are as follows:

	<i>Comp.</i>	<i>Cyl. P.</i>	<i>Jobbers</i>	<i>Bind'y</i>
John Richards	\$201.60	.....	.....	.....
Chas. Edmunds	\$43.36	\$90.24	\$46.00	
R. R. Hicks.....	214.50	.....	.....	.....
Totals	\$416.10	\$43.36	\$90.24	\$46.00

This method of ascertaining the pay roll of each center can be followed whether with three employees or a thousand.

A cut leaf pay roll book may also be used, writing in heads for each of the centers, with the employees sub-divided, and practically the same method used.

The method or manner does not count for so much as the result. Obtain this result, as long as it is accurate, in the simplest manner possible.

Where an employee works regularly in a productive center, and is *occasionally* called to another, it is the usual rule to figure all except *that* portion of the employee's time

QUESTIONS ON THE PAY ROLL 11

against his *regular* department, unless the delay or non-productive time is occasioned by the other center, or in other words, non-productive time should generally be charged to his regular productive center.

QUESTIONS

1. What is the difference between methods used by accountants and the productive center methods?
2. What is a productive center?
3. Should more supervision be charged against a highly paid man than a low paid man?
4. What is included in the productive center pay roll?
5. What about an employee who works in more than one productive center?
6. How are his wages sub-divided?
7. Give an example of divided pay roll.
8. What is the difference between "department" and "productive center?"
9. How is labor cost for chargeable hours found?
10. How is percentage of departmental non-productive time found?

II

FIGURING BUILDING EXPENSE

Each productive center occupies more or less space, according to its needs. The cost of this floor space must be figured according to the space used by each productive center.

If the building occupied is owned by the concern which also owns the plant, a rental charge should be made for occupancy in the same amount as though the building was rented.

Many errors are made in figuring floor space, even by those who understand the problem, and these should be discussed before actual examples are shown, in order to prove that there is only one correct method.

Let us consider first the proposition of the concern owning its own ground and the buildings. Because it has money thus invested is no reason why it should not receive a legitimate return on that investment.

The building was probably erected for the sole purpose of housing the plant and would

cost considerable money to alter for another tenant. That also should be considered as a factor. It would be unwise to take only the value of the land, the buildings, etc., figure the interest return, taxes, insurance, repairs and other items as a basis for figuring the rent. Location, increase in land values, possible changes in the building laws, depreciation of property, and many other things should be taken into consideration. The rental charge should be based solely on the value of the building for rental purposes, just as though the building were being rented by a second party.

Again, a tenant (or several tenants) may be occupying part of the building and the concern may figure that by this method it receives free rent. This is of course a fallacy; and even if such were the case, there is no good reason why a proportionate amount should not be charged for the space occupied, and reckoned as an additional source of income.

If the building housing the printing plant is owned by the business itself or is listed as a part of its assets, as in the case of a corporation, or is owned by the proprietor of the business, a rental for the space occupied

must be included in the monthly expense to the same amount as would be paid for the same space to any other landlord. In the absence of any stated figure the present proper rental charge may be determined as follows: Figure the interest on the present sale value of the land and building—not the appraised value for taxation purposes—at not less than 6 per cent per annum and at a higher rate if local conditions warrant. To this amount add the taxes on the property and the insurance on the building, and also all the expense items which naturally are carried against such property, such as street improvements, street sprinkling, sidewalk and sewer taxes and repairs, using the average annual amount. Depreciation on the building must be figured at a fair and equitable rate. On brick, stone and cement buildings the usual rate for depreciation is from 2 to $3\frac{1}{2}$ per cent, and on frame buildings from 5 to 7 per cent per annum, based on the building cost and the character of the building originally. This amount is to be added to the amounts above, the total divided by 12 which gives the monthly rental charge on the building at cost, but to this should be added a fair

rental profit, as the owner is properly entitled to a profit over and above the interest on his investment. If the building is occupied by others besides the printing office the amount of the rental should be adjusted fairly as between the occupants.

When a loft or building is rented, of course the rent must be taken into account. No argument can be brought against that, and even if the building is owned by the concern occupying it, a liberal amount should be allowed for a rental charge on the space occupied.

Floor space is floor space, whether occupied by desks, cases, presses or ruling machines. Each is placed with a view to the greatest efficiency and practicability. It would show a lack of wisdom to locate the salesman's desk on the sixth floor rear. It would be equally foolish to put the stitchers just inside the entrance. Each has its proper place, but the floor space for each is equally valuable.

The fact that the office is located on the first floor right near the entrance does not enhance the value of its floor space per foot over that occupied by the job presses which are located farther away.

Every inch of floor space is of equal value to a plant, and to say that one is worth more than another is to ignore the fact that if conditions in regard to arrangement of the plant were reversed there could be no readjustments with reference to value, of that floor space.

In figuring floor space by the productive center method, each center is charged with the floor space it occupies and uses, and that only. The number of employees working in it, whether one or twenty, has no bearing upon this point. All the space is measured off and divided according to its use.

The best method of accomplishing this, is to prepare a floor plan or plat, showing the location of each machine in correct measurements, allowing enough space around each item of equipment to enable the worker to handle it efficiently. This will enable the cost clerk, by the use of a ruler, to indicate the floor divisions, and figure out the square feet in each productive center. If this is not practicable, the space may be measured with a tape line, and the total amount of space, in square feet, for each productive center determined and recorded.

All space occupied by elevators, stairways, aisles, rest rooms, toilets, hallways, heating plant or stoves should be figured out and not included in the space used for the productive centers. The disposition of this space and the method of caring for the rental of it will be taken up in a later chapter.

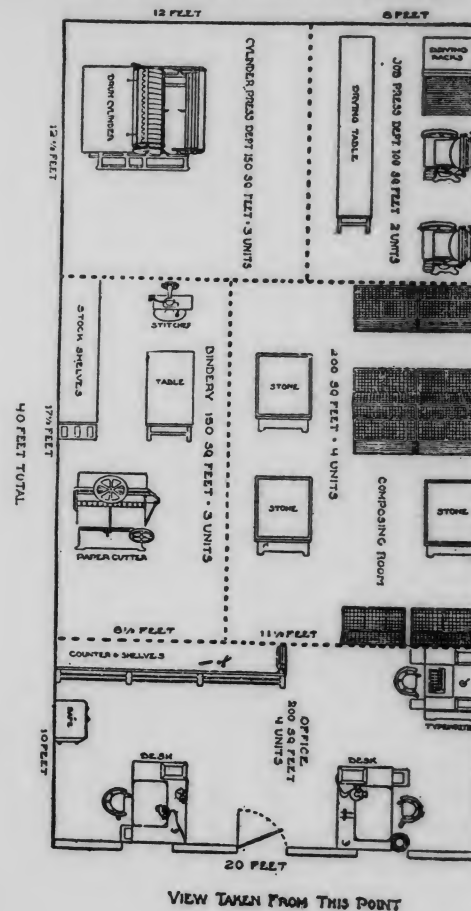
If a floor contains more than one center, it should be figured out proportionately.

It is being taken for granted that the shop is already divided into productive centers, and that the time reports are arranged according to these centers. In measuring off the floor space, be careful to include in each productive center exactly the amount used in each center.

A diagram, or layout of a small printing office is given on page 19, in order to show the method of measuring off the floor space. While this is but a small shop, the principle involved may be applied to any size printing office.

The office occupies ten feet in the front part of the building; or 200 square feet of space. A dotted line shows the division line between the office floor space and that of the productive centers.

The composing room and bindery occupy



the middle portion of the space, a distance of $17\frac{1}{2}$ feet back. The space between these two centers is shown as being equally divided by a dotted line running between the stones and the table.

This is working space, and necessary to each; one-half of the space is charged to the composing room, the other half charged to the bindery.

The composing room occupies a space $11\frac{1}{2} \times 17\frac{1}{2}$ feet, or nearly 200 square feet.

The bindery occupies a space $8\frac{1}{2} \times 17\frac{1}{2}$ feet, or nearly 150 square feet.

The press room occupies the back part of the floor space, and is divided between the job and cylinder presses, as each of these are separate productive centers. The division line is drawn a few feet from the drying table of the job presses. A cylinder press takes more room for stock, handling of forms, drying room, etc., and the working space has been charged to the productive centers according to the use as found in this case. Each center must have charged to it all the floor space it actually occupies or uses in order to produce its part of the work.

The job press room is $8 \times 12\frac{1}{2}$ feet or 100 square feet.

The cylinder room is $12 \times 12\frac{1}{2}$ feet or 150 square feet.

In order to use as few numbers as possible, and to get rid of useless small figures, the floor space occupied by the various productive centers, should be reduced to fifty-foot units. The problem is easy, and saves a great deal of time. When a space is 96 square feet, it should be counted as two units, 157 square feet as three units. Taking the floor space as described and given, it would figure in fifty-foot units as follows:

Office	200 sq. ft. = 4 units
Composition	200 sq. ft. = 4 units
Bindery	150 sq. ft. = 3 units
Jobbers	100 sq. ft. = 2 units
Cylinders	150 sq. ft. = 3 units
Total	16 units

Four elements enter into building expense. One is rent, discussed above, the others are heat, janitor and repairs.

Where heat and repairs are included in the rent, these items do not need to be taken into account.

Heat should be charged against the productive centers on the same basis as rent, and

if produced by stoves, is easy to figure. If a large heating plant is used, the item becomes more complicated. It should be figured on the basis of interest on the value of the heating plant, depreciation, repairs, the cost of coal, labor, cost of hauling away ashes and other incidental charges, as well as for the space it occupies. This problem will be shown later.

Janitor service, in the larger plants, where this employee does no other work or where he gives at least one-half of his time to this work, the expense of janitor work should be treated as a building expense and distributed against the productive centers in the same manner as rent and heat. In the smaller plants where the regular employees do this work in the various departments the time used should be treated on the employee's time report as non-chargeable and the value of this time should be charged against Office Expense. Treated in this way the expense of janitor work would be distributed against the productive centers as a part of the office or general expense.

Repairs necessary to the proper up-keep of the building, where the building is owned by the printing concern, should also be consid-

ered. The four items must be figured separately, and totalled.

Example—Rent	\$40.00
Janitor	25.00
Heat	10.00
Repairs	5.00
	<hr/>
	\$80.00

The total amount of the four can then be divided by the sixteen fifty-foot units, to ascertain the cost per unit.

Example— $\$80.00 \div 16 = \5.00

The units cost \$5.00 each for the four items and the different divisions of floor space are charged accordingly.

Example—Office	4 units \times \$5.00 = \$20.00
Composition ..	4 units \times 5.00 = 20.00
Bindery	3 units \times 5.00 = 15.00
Jobbers	2 units \times 5.00 = 10.00
Cylinder	3 units \times 5.00 = 15.00
	<hr/>
Total	\$80.00

Each division of floor space is thus charged with the correct amount. It occupies the space, therefore it must bear the burden of that cost.

QUESTIONS

1. *What is the correct way in which to charge floor space?*
2. *What is the correct way in which to figure rental of building occupied by the owner?*
3. *Suppose the owner does not occupy the entire building, but rents a portion out, how should the rental be figured?*
4. *Should the price of floor space be figured according to location? If so, why?*
5. *What is the best method of ascertaining the floor space occupied by a productive center?*
6. *What about the elevator, stairway, aisles and toilet room?*
7. *Where should working space be figured?*
8. *What is meant by square foot and how is it ascertained?*
9. *Why should one machine be charged with more floor space than another?*
10. *What is a fifty-foot unit?*
11. *What elements enter into building expense?*
12. *How should janitor work be charged in large plant? How in small plant? Why the difference in treatment?*
13. *Give example of division of building expense by units.*

III

FIGURING THE INVENTORY

The money which a man has invested in a plant must bring him a suitable interest return, and must also provide for the replacement of the plant as it wears out, becomes obsolete or inefficient.

There can be no argument against interest on investment being a legitimate charge against cost of doing business as if the amount were invested in a loan of any kind it would produce an interest return without labor. It follows that capital invested in a printing plant must produce an interest return before any profit can be figured.

The same is true in regard to replacement of worn or obsolete machinery and material. The business must provide for a replacement fund sufficient to keep the plant fully up to its primary value before any profit can be figured. If a plant becomes run down it becomes less efficient with a consequent higher production cost and the keeping of the plant

fully efficient is a legitimate charge against the cost of doing business and must be included in the figuring of cost.

The productive center method of figuring costs on this necessary phase of the business is based on the valuation of the equipment necessary to do the work in that center.

Aside from the wages and the rent paid, there is no more important item in the figuring of costs than the value of the machinery and equipment. It is a sad fact that comparatively few manufacturers, including printers, know the value of their plants, and yet they attempt to do business, figure costs, and claim they are making money.

The basis of the business is the plant that has been bought and installed, and although it must have labor and a place in which to do business, yet without a plant there could be no production.

As the pay roll and rent have been figured according to the productive centers, the machinery and material of the plant must also be listed according to these productive centers.

The three primary productive centers or departments of a printing office are the composing room, the press room and the bindery.

These with the business office are necessary to every printing plant, whether large or small. The office comes first on the summary sheet, and the value of the office furniture must be considered.

While the office is not a productive center, yet it is the means of securing the work, doing the necessary accounting, and taking care of the numerous business details. Therefore, the office furniture should be considered an integral part of the plant and its equipment in the way of desks, filing cabinets, safes, typewriters, account books, etc., must all be listed.

The composing room is a single productive center, but may be sub-divided into several parts. It is usually sub-divided into hand and machine composition.

The press room can also be divided into several sub-divisions or centers, according to the size, style and cost of the presses. The usual sub-divisions of the press room in a small plant are the job press center and the cylinder press center. In larger plants a further sub-division is necessary as: platens 10 x 15 and smaller, 12 x 18 and larger, Universal or Colt's Armory style, auto feed platens 10 x 15 or smaller, auto feed 12 x 18 and larger,

Kelly or other automatic presses. Cylinders: pony 22 x 32 and smaller, medium 25 x 38 to 32 x 44, large 38 x 50 and larger. If there are automatic feed cylinders they should be in a class by themselves. As many of these classifications should be used as is necessary to properly departmentize the press room.

The bindery is capable of a great many subdivisions, from the simple one of the small shop that has a paper cutter, and does only such work as padding, folding, check binding, etc., to larger and more complicated plants.

The best method of taking an inventory is to have a reliable appraisal company list the property. These men are trained in this work, and will do it in a manner which no one else could hardly equal.

The important part, however, is to get a correct value on the production centers of the plant. Costs are based on the value of the plant, not what was actually paid for the material and then "depreciated" by some sort of mathematics, but the actual worth of the plant if it were to be replaced today.

There is a great difference between an inventory and an appraisal. An inventory is usually based upon the original cost of an

article, and a high or low price may have been paid for it—quite different from the market or going price of such an article. On the other hand, an appraisal is based upon what the article is worth to-day, and then depreciated for insurance and taxation purposes according to style or type of article, its age and efficiency. There is at all times a junk value to an article, aside from its efficiency or productive value, and this, of course, must be taken into consideration.

In figuring out a plant for cost-finding purposes many err in putting a low valuation upon machinery bought at an unusual advantage. Where an owner strikes a special bargain in type or machinery, the advantage should not enter into the cost-finder's calculations at all. Material thus bought has an appraised value for production purposes wholly disconnected with its bargain price. Modern cost experts are agreed that, for cost finding purposes, the inventory of office and all production centers should be carried at the present cost values. All replacements of worn or obsolete equipment and any additions to the equipment purchased from capital stock investment must, necessarily, be made at the present values. The

In the press room list each press, with all the extras, individual motors, belting, shafting, including all wire connections and cost of installation, etc.

The various sub-divisions of the bindery should each be listed separately to permit of additions.

As additions to the equipment are made they must be entered upon the proper departmental sheets.

When items of equipment become obsolete or worn out and are scrapped they should be checked off on the inventory sheet and the inventory value deducted from the total of that productive center. When replaced the new items should be itemized and a new total carried forward.

The loose leaf form of a plant inventory has the great advantage that as the plant increases new sheets may be inserted as needed for each productive center.

The best way to take an appraisal is to list the entire plant, and sheets of paper $5\frac{1}{2} \times 8\frac{1}{2}$ inches padded 50 sheets to the pad should be provided for the purpose. Starting from some well defined point, every item of equipment must be put down—all tools, except

such as come with the machines, all extras, belting, shafting, etc. Let no small item escape notice. List the small things first—the big ones last.

Do not list over eight items on one sheet, and then number and put away. Later they should be given to a second person to check over to see if they are correct and nothing left out. No attempt at fixing prices should be made on these sheets.

These sheets are then assorted by productive centers and listed on blank sheets by somebody who writes a plain, legible hand, or it may be done on the typewriter. Compare this listing carefully with the slips, to see that nothing has been omitted.

The pricing comes next, and if possible, secure the assistance of a well posted printers' supply salesman. Most of them will be only too glad to help you, and their employers will sanction anything of this kind, as they know the value of an inventory or appraisal for obtaining costs.

There are often questions arising as to what equipment is to be included in a productive center, as for instance, where one article is used in several divisions, such as chases and

sectional blocks. In this case they are a necessary part of the composing room equipment in order that the type and plates can be sent to press, and should be put in the composing room equipment.

The cutter in the bindery is often a problem where forwarders, the regular stockman and rulers all use it. Usually the split pay roll method is used, creating a cutting center or department and each man's salary charged to it. The best and easiest way is to figure the problem carefully and divide either the time or the equipment according to the needs.

It is impossible to anticipate each point that might arise in a plant, but the safest plan is to charge each productive center with the equipment made necessary by either the starting or the actual production of the work in that center.

But, above all, have a correct listing of the plant, one as near right as man can make it, divided as to productive centers, listed in such a manner that changes may be easily made—either additions or deductions.

QUESTIONS

1. *What is a prime necessity in a manufacturing business?*
2. *Is it necessary in order to understand costs to know the value of the plant?*
3. *If so, why?*
4. *How should the plant be listed?*
5. *The office is not a productive center; how about that?*
6. *What are the usual productive centers in a printing plant?*
7. *Can there be sub-divisions?*
8. *What kind of a value should be placed on the plant?*
9. *What method should be pursued to ascertain the value of the plant?*
10. *How are additions or deductions made?*
11. *State possible conflixtions as to centers and how they should be equalized?*

IV

FIGURING REPLACEMENT VALUES

The man who fails to take into account the possible wearing out or depreciation of his machinery through new inventions, deterioration or disuse, will some day find himself with a plant consisting of junk and the new man just starting in able to beat him in the race for business.

These are competitive days in the business world, and the man who does not keep up the youth of his plant must fall behind. This one factor has been overlooked by many manufacturers, and they have failed to allow a replacement charge as a general expense item in conducting their business.

Many have figured "overhead," which is a mythical sum liable to mean much, or again very little. This was generally supposed to carry a load to cover various expense items; but replacement is not an "overhead"; it is a positive, distinct and important item of cost.

38 HOW TO FIGURE COSTS

It is not related to depreciation—a thing never really depreciates entirely. There is always some value left. Replacement is a positive thing, and if it is considered that the productive life of a machine will be ten years, then an amount equal to one-tenth the value of the machine must be charged as a direct cost to its productive center annually.

As stated, a machine never depreciates to the point of losing all value. It has always a junk value, and many times will do effective work twenty or thirty years after its purchase. The old hand scythe will still cut grain, but the farmer wants a modern harvester, the very latest model. So with any machinery, the latest only will do, and a plant must always be kept young.

Figuring a replacement value of 10 per cent on each productive center means that each year one-tenth of the value is either laid aside in actual money for replacement, or that amount of new material is put in to keep the plant young.

That the difference between depreciating 10 per cent per year, and replacement of 10 per cent per year may be appreciated, two tables are given, presenting the differences.

TEN PER CENT. REPLACEMENT DEDUCTED FROM ORIGINAL INVESTMENT					
Year	Investment	%	Replc'm't	Balance	
1	1000 00	10	100 00	900 00	
2	900 00	"	100 00	800 00	
3	800 00	"	100 00	700 00	
4	700 00	"	100 00	600 00	
5	600 00	"	100 00	500 00	
6	500 00	"	100 00	400 00	
7	400 00	"	100 00	300 00	
8	300 00	"	100 00	200 00	
9	200 00	"	100 00	100 00	
10	100 00	"	100 00	00	

TEN PER CENT. DEPRECIATION DEDUCTED FROM BALANCES									
Year	Investment	%	Depreciation	Balance	Year	Investment	%	Depreciation	Balance
1	1000 00	10	100 00	900 00	50	5 71	10	57	5 14
2	900 00	"	90 00	810 00	51	5 14	"	51	4 63
3	810 00	"	81 00	729 00	52	4 63	"	46	4 17
4	729 00	"	72 90	656 10	53	4 17	"	42	3 75
5	656 10	"	65 61	590 49	54	3 75	"	37	3 38
6	590 49	"	59 05	531 44	55	3 38	"	34	3 04
7	531 44	"	53 14	478 30	56	3 04	"	30	2 74
8	478 30	"	47 83	430 47	57	2 74	"	27	2 47
9	430 47	"	43 05	387 42	58	2 47	"	25	2 22
10	387 42	"	38 74	348 68	59	2 22	"	22	2 00
11	348 68	"	34 87	313 81	60	2 00	"	20	1 80
12	313 81	"	31 38	282 43	61	1 80	"	18	1 62
13	282 43	"	28 24	254 19	62	1 62	"	16	1 46
14	254 19	"	25 42	228 77	63	1 46	"	15	1 31
15	228 77	"	22 88	205 89	64	1 31	"	13	1 18
16	205 89	"	20 59	185 30	65	1 18	"	12	1 06
17	185 30	"	18 53	166 77	66	1 06	"	11	95
18	166 77	"	16 68	150 09	67	95	"	10	85
19	150 09	"	15 01	135 08	68	85	"	9	76
20	135 08	"	13 51	121 57	69	76	"	8	68
21	121 57	"	12 16	109 41	70	68	"	7	61
22	109 41	"	10 94	98 47	71	61	"	6	55
23	98 47	"	9 85	88 62	72	55	"	5	50
24	88 62	"	8 86	79 76	73	50	"	4	45
25	79 76	"	7 98	71 78	74	45	"	3	40
26	71 78	"	7 18	64 60	75	40	"	2	36
27	64 60	"	6 46	58 14	76	36	"	1	32
28	58 14	"	5 81	52 33	77	32	"	0	29
29	52 33	"	5 23	47 10	78	29	"	0	26
30	47 10	"	4 71	42 39	79	26	"	0	23
31	42 39	"	4 24	38 15	80	23	"	0	21
32	38 15	"	3 82	34 33	81	21	"	0	19
33	34 33	"	3 43	30 90	82	19	"	0	17
34	30 90	"	3 09	27 81	83	17	"	0	15
35	27 81	"	2 78	25 03	84	15	"	0	13
36	25 03	"	2 50	22 53	85	13	"	0	12
37	22 53	"	2 25	20 28	86	12	"	0	11
38	20 28	"	2 03	18 25	87	11	"	0	10
39	18 25	"	1 83	16 42	88	10	"	0	9
40	16 42	"	1 64	14 78	89	9	"	0	8
41	14 78	"	1 48	13 30	90	8	"	0	7
42	13 30	"	1 33	11 97	91	7	"	0	6
43	11 97	"	1 20	10 77	92	6	"	0	5
44	10 77	"	1 08	9 69	93	5	"	0	4
45	9 69	"	97	8 72	94	4	"	0	3
46	8 72	"	87	7 85	95	3	"	0	2
47	7 85	"	79	7 06	96	2	"	0	1
48	7 06	"	71	6 35	97	1	"	0	0
49	6 35	"	64	5 71					

The upper table shows how \$1,000 is replaced in ten years, as should be figured in all manufacturing plants.

The lower table is not absolutely correct, but it shows that by deducting 10 per cent each year from the amount of the preceding year, or depreciating, the equipment would not be entirely depreciated for 97 years, an impossible time. As a matter of fact, if decimals are used, there would still be some left after 1,000 years. It could never be depreciated entirely.

The two tables, however, show quite clearly the difference between the methods of replacement and depreciation.

The inventory is listed by productive centers, and the replacement must also be figured for each productive center.

In the method for figuring floor space, a small office was shown, and for an example in figuring replacement, the equipment as shown there will be used.

The office furniture is valued at \$251.65; the composing room at \$1,246.32; the job presses at \$941.84; the cylinder press at \$1,502.85, and the bindery at \$651.84, totalled as follows:

TEN PER CENT REPLACEMENT 41

Office	\$ 251.65
Composition	1246.32
Job press	941.84
Cylinder	1502.85
Bindery	651.84

Total\$4594.50

The plant is worth \$4,594.50 and ten per cent per year would be \$459.45. This amount must be allowed each year as a replacement fund.

As the summary of costs must be figured each month, one-twelfth of this amount should be used each month.

$$\$459.45 \div 12 = \$38.29$$

The amount of the replacement each month is therefore \$38.29. This must be divided among the productive centers in proportion to the value of each center.

For ease in figuring, each amount is reduced to \$50 units as follows:

Center	Value	\$50 Units of Value
Office	\$ 251.65	= 5
*Composition	1246.32	= 25
Job press.....	941.84	= 19
Cylinder	1502.85	= 30
Bindery	651.84	= 13
Total		92

*The composing center value is used as an example for obtaining \$50 units.

42 HOW TO FIGURE COSTS

To get the units, divide the total value of a center by 50, eliminating the cents and using the composing room valuation as an example:

$$1246 \div 50 = 24.9$$

The .9 being greater than one-half, it is counted as a whole unit. If the fraction is less than one-half it is disregarded. Therefore the composing room units would equal 25.

The total of 92 units represents the value of the plant. The replacement value for one month is \$38.29, and this is divided by 92 units to ascertain the value of each unit.

$$\$38.29 \div 92 = .42 \text{ minus}$$

The result is 42 cents replacement for each unit and it is an easy matter to figure the replacement for each productive center, by multiplying the units of each separate center by the value as follows:

<i>Department</i>	<i>Units</i>	<i>Value</i>	<i>Amount</i>
Office	5	$\times 42c =$	\$ 2.10
Composition	25	$\times 42c =$	10.50
Job press	19	$\times 42c =$	7.98
Cylinder	30	$\times 42c =$	12.60
Bindery	13	$\times 42c =$	5.46
			<hr/>
			\$38.64

REPLACEMENT VALUES 43

The table is not quite correct, as 42 cents was not the exact amount. The balance was 57, but instead of carrying out further decimals, it was counted as one; 57 from 92 leaves 35—the exact amount we have more than the actual replacement value.

In order that the figures may come out exactly, this amount is deducted from one or more of the productive centers—usually those that have the least work, or are idle. In this plant the cylinder press is the least productive, so the amount is deducted from that center, and we find that our replacement values figure as follows:

<i>Center</i>	<i>Amounts</i>
Office	\$ 2.10
Composition	10.50
Job press	7.98
Cylinder	12.25
Bindery	5.46
	<hr/>
Total	\$38.29

It makes no difference how many centers there are, two or a hundred, they may all be figured in the same way.

In some centers, more than 10 per cent should be figured, for instance—type. This

wears out rapidly, especially in exclusive job shops, and 25 per cent should be figured on the type values. As 10 per cent is already figured, all that is necessary is to figure one-twelfth of 15 per cent of the value of the type in addition, which will give the amount.

QUESTIONS

1. *Why should replacement be figured?*
2. *Is not replacement "overhead"?*
3. *What is depreciation?*
4. *Are replacement and depreciation the same?*
5. *How should they be figured?*
6. *What amount is generally figured as replacement per year on machinery?*
7. *How is the yearly amount reduced to a monthly sum?*
8. *Why is a \$50 unit the value used?*
9. *Give an example of reducing an amount to \$50 units.*
10. *Having the units, how is the replacement value of the unit found?*
11. *How are the replacement values applied to the several productive centers?*
12. *Should balances be ignored or figured in?*
13. *How is extra replacement in excess of 10 per cent to be taken care of?*
14. *How many productive centers may be figured this way?*
15. *Give an example.*

V.

FIGURING INTEREST ON INVESTMENT, INSURANCE AND TAXES

An investor expects a return on his money. He not only wants to see what his money has bought, but wants a just interest return at a given period for the use of the money.

In figuring replacement, care has been taken that the value of the investment shall always remain at par; but it is not enough to keep the investment intact, a dividend must be realized on it.

It does not matter if the investment is clear of incumbrance or not—a return must be made—and this is doubly important if there is a mortgage or notes to be paid, as the interest must be met, and how meet it except by including it in the cost?

A distinction must be made between working capital and investment. The term "working capital," as applied to a printing business, primarily means the actual amount of money

required to keep the business and shop going from month to month or year to year as distinguished from the investment in type, machinery and other material equipment which constitutes the plant itself. The amount of this naturally depends on the number of employees, the volume of output and the class of product. This also naturally involves the amount of the working capital tied up in "work in process."

There is some disagreement among cost accountants as to whether interest on working capital as a whole should be charged into costs. There is, however, almost unanimous agreement that the amount involved in "work in process" from month to month should be considered as an investment and the interest thereon to be included in the costs of each productive center.

One of the highest authorities in this country says: "It seems obvious, upon analysis, that there is a fixed charge for carrying an inventory of Work in Process." He says also: "The charges for taxes, insurance, interest on the investment in material and labor will vary according to the volume of Work in Process inventory and the amount charged to cost

should be reckoned on the value thereof, preferably from month to month."

Interest on investment of capital in equipment of the factory is considered a legitimate part of factory cost by all authorities and the question naturally arises why should not interest on working capital be treated the same way as is interest on the capital invested in the factory equipment. Capital invested for one use should certainly be treated in the same manner as capital invested for any other use in connection with the same business.

This matter is especially pertinent in the case of the larger plants where the inventory of Work in Process, each month, runs into a considerable figure. In the smaller printing plants, however, the interest on the working capital and on the amount involved in Work in Process, which is a part of the working capital, would be so inconsiderable that the monthly increment when distributed against the productive hours of the various centers would have little or no effect on the hour costs of those centers. In the small plants, therefore, it is practically useless to take the time and trouble to figure it out.

The matter is treated here now so that the

student of cost finding may have a complete understanding of the principles involved in the treatment of working capital and work in process.

In many plants, also, it will be found that the amount of working capital will be greater than the equipment investment.

Interest cannot be figured on "good will" as the good will of a printing business is what the owner has made it through the business methods of himself and his assistants and the return from this item must come from the increased profits due to that good will. Neither, in most cases, should interest be figured on copyrights, exclusive control, and other items of a like nature. Profits must take care of all these. The amount invested in equipment and material should, of course, bear an interest item as a part of the cost, and the only way to be certain of receiving it is to include it in the costs; as profits are elusive—cost a certainty.

Interest on investments, insurance and taxes, all have a close relationship. Insurance is paid for in accordance with the amount of machinery or material in the plant. The rate is fixed, and as much is paid as is necessary

to fully protect the investment. Taxes are levied on the amount of the investment, in direct proportion to its value.

These three items being of a similar nature, can all be figured in exactly the same way. On the expense distribution forms used in all modern cost systems interest on investment is distributed on one line, and insurance and taxes on another. Some methods combine these three and replacement, calling it "Plant Investment Expense," grouping them together, and making one distribution. The latter method is often preferred as being more simple and more easily understood.

First we will figure interest as a single item, and then insurance and taxes, and later on take up the group method.

It has become a trade custom to figure interest on investment at the same rate at which interest is figured on long time loans in the section of the country where the printing plant may be located. This rate is commonly 6 per cent in the eastern section and 7 or 8 per cent in the western portion of the country where interest rates are higher.

Many cost experts are, however, of the opinion that the interest rate on a manufacturing investment should be considerably higher

than the interest rate on long time secured loans; that it should be, especially on a printing plant investment, not less than 10 to 12 per cent a year. On a long time secured loan there is much less risk of loss than on an investment in any line of manufacturing and this risk of loss is particularly applicable to the printing business as those familiar with its history will fully appreciate.

New material and equipment once placed in a printing office and used, even a very short time, shrinks in value one-half or more should any combination of circumstances compel an enforced sale. In addition to this shrinkage there must be taken into account the many risks of manufacture inseparable from this business and the indisputable fact that the printing business, as ordinarily conducted, has never shown a margin of profit either commensurate with the investment or large enough to make the business a safe investment risk. For these reasons the interest on the investment should be greater than the rate now in customary use in the industry but until such time as the trade organizations take action to change this the present rate must continue to be used.

We have figured the value of the plant at

\$4,594.50. Using 6 per cent as interest on investment, we find that the return on this item should be \$275.67 per year, thus:

$$\$4,594.50 \times .06 = \$275.67$$

This will amount to \$22.97 per month, when figured as follows:

$$\$275.67 \div 12 = \$22.97\frac{1}{4}$$

When 6 per cent is used there is a more simple method by taking one-half of one per cent as follows:

$$\$4,594.50 \times .005 = \$22.97\frac{1}{4}$$

Referring back to where the replacement fund was figured, it is found that the plant contains 92 units of value, so the interest cost per unit is 25 cents minus, as shown below:

$$\$22.97 \div .92 = .25 -$$

The total interest on investment (\$22.97) should, therefore, be figured as follows:

Center	Units*	Value	Amount
Office	5*	$\times 25c =$	\$1.25
Composition	25	$\times 25c =$	6.25
Job press	19	$\times 25c =$	4.75
Cylinder	30	$\times 25c =$	7.50
Bindery	13	$\times 25c =$	3.25
			<u>\$23.00</u>

*See figuring replacement values on page 42.

This leaves a balance of 3 cents difference over the actual amount. The 3 cents may be deducted from the bindery item, making it \$3.22, and this change will make the balance correct.

Insurance and taxes are figured in exactly the same way.

Insurance at \$2.50 per hundred on \$4000.00 would be \$100.00 per year; taxes would be about \$35.00 per year; a total of \$135.00.

This is the annual cost. To get the average monthly cost, divide by 12, which amounts to \$11.25 as follows:

$$\$135.00 \div 12 = \$11.25$$

To get the unit of value cost, this amount is divided by 92, the result being .122 cents as follows:

$$\$11.25 \div 92 = .122$$

This amount is then distributed to the different centers as follows:

Center	Unit	Value	Amount
Office	5 ×	.122c =	\$.61
Composition	25 ×	.122c =	3.05
Job press	19 ×	.122c =	2.31
Cylinder	30 ×	.122c =	3.66
Bindery	13 ×	.122c =	1.58
			<hr/>
			\$11.21

This is not quite correct, as .122 is not exact. There is a difference of .0112 cents. This may be equally divided among the various centers so as to make the amount exact.

The group method of figuring is the simplest, as all four items are distributed at once, saving a great deal of work, and it is just as accurate as the other.

These several items are as follows:

Replacement .....	.....	\$38.29
Interest on investment ...	.....	22.97
Insurance and taxes .....	.....	11.25
Total .....	.....	<hr/>
		..\$72.51

The unit value of this amount would be .788 cents as follows:

$$\$72.51 \div 92 = .788 + \text{with a balance of .014c.}$$

This amount is distributed as follows:

Center	Unit	Value	Amount
Office	5 ×	.788c =	\$ 3.94
Composition	25 ×	.788c =	19.70
Job press	19 ×	.788c =	14.97
Cylinder	30 ×	.788c =	23.64
Bindery	13 ×	.788c =	10.24
			<hr/>
			\$72.49

Again the amount is not exact, as the division showed a balance of .014 cents. Here there is a difference of 2 cents. This amount may be added to the busiest department, as being more easily absorbed.

It will be seen that this method makes the problem quite simple.

It must be understood that the monthly amount should be figured according to the rules laid down previously.

We have taken care of a few of the "stickers" in the way of figuring costs, but there are some other problems just as hard to understand, yet as easy to figure when fully explained. The basis of all being to charge direct to each center its just proportion of expense that can be considered as belonging to that center. Having once accomplished this, and having the production of that center, as expressed in saleable or productive hours, the problem of costs is now in a fair way to be solved.

QUESTIONS

1. *Is it necessary to figure interest on investment?*
2. *Upon what basis should it be figured—upon that of actual equipment invested, or that investment plus working capital?*
3. *Why?*
4. *How about profits?*
5. *How is a fair interest rate arrived at?*
6. *Is the rate now in use equitable?*
7. *Upon what basis is this distributed to the various centers?*
8. *Is there a relation between "interest on investment" and "insurance and taxes"?*
9. *How are they distributed among the productive centers?*
10. *Should insurance and taxes be averaged each month?*
11. *What is the "group method" of distributing expense to centers?*
12. *Give an example.*
13. *What is the basis of cost finding?*
14. *Explain the difference between investment and working capital.*

VI

DISTRIBUTING POWER

Nothing illustrates quite so well the principle of the productive center being the correct unit for ascertaining costs, as the method of figuring the cost of power. The primary unit is the productive center, and this unit must bear all the burden of every direct cost. For that reason power is always figured as an absolute direct cost against each productive center using power.

Power is either purchased in the form of electricity from a distributing point, or manufactured by a gasoline or gas engine, steam engine or otherwise, on the premises. In any case the cost of this power can be easily found and charged direct to each interested productive center.

Where power is purchased in the form of electricity there are three ways in which the cost can be charged to each productive center,

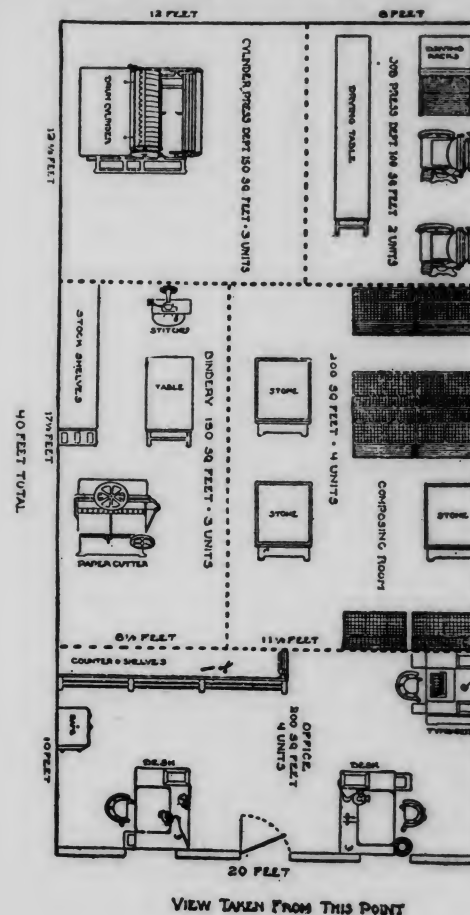
and each of these will be described, using as a basis the equipment as shown in figuring the floor space. The plan is reprinted on the following page for easy reference.

There are three departments that consume power in the plant as illustrated: Bindery, job press and cylinder press. In the bindery, a four h.p. motor is attached to the paper cutter, and a one-eighth h.p. motor to the stitcher. The job presses each have a one-half h. p., and a three h.p. motor drives the cylinder.

The most accurate way to ascertain the cost of power for each of these machines is by installing a system of wiring so that each productive center shall be on a different meter. At the end of each month, the meters will record the amount of electricity consumed in each center, and it is then an easy matter to charge the center with the cost of the electricity used.

This method, while the best, is quite expensive, and requires special wiring, and is not used to any great extent.

The method of distributing power used in modern cost finding systems is to distribute the amount of the power bill among the productive centers, using power, on the basis of horse-power hours.



To find the horse-power hours it will be necessary to know the amount of power required for each machine in the productive center. The horse-power hour is simply the power required to drive the machine at its working capacity, multiplied by the number of running or productive hours for that machine, this amount equals the horse-power hours.

Where the different machines in a printing office are driven by individual motors it is an easy matter to find the horse-power hours as the power of the motor is indicated by a plate attached to the motor and it is only necessary to multiply this indicated horse-power of the motor by the number of productive hours of the machine in question. When two or more machines are driven from the same motor, particularly if the two machines belong to a different productive center, it will be necessary to have a little additional information.

A 10x15 or smaller job printing press requires one-half horse power, larger than a 10x15 three-quarters horse power, while the Universal type jobber requires one horse power. The average pony cylinder press requires about one and one-half horse power, a drum cylinder newspaper press two and one-

half horse power, and the two revolution cylinders require from three to five horse-power, according to size.

Where two or more machines are driven from the same motor it will be necessary to multiply the power needed to drive each machine by the active hours of that machine, which will give the horse-power hours.

Where the machinery of the entire plant is driven from one large motor, the same procedure must be used to find the horse-power hours of each department.

In some printing offices a gas or gasoline engine is still used for power and it will be necessary to find the amount of the power bill in such case. The power bill will then be represented by the cost of running the engine which would be made up of the cost of the gas or gasoline used during the month, lubricating oil, waste, rent of space used, repairs, depreciation, interest on investment, and all other items of expense properly chargeable against the engine to which must be added a charge for the time or labor used in caring for the engine. The total of these costs would represent the power bill for the month which would then be divided against the productive

centers in proportion to the horse-power hours of each.

With an installation of this kind it will be necessary in cost finding for the month, to in some way distribute the cost of the engine and its equipment among the productive centers. This can be done through the inventory by charging against each productive center an amount of the cost of the engine and its equipment in proportion to the horse-power required by these centers. This is a rather cumbersome method, however, and the better way is, in case of either a gasoline or steam engine installation to drive the plant, to make an entirely separate center of the power department. Where this is done the rental for the amount of space occupied by the engine, the interest on investment, insurance and taxes, its depreciation or replacement value, the labor of attending to the engine, all fuel, whether gas, gasoline or coal, all lubricating oils, etc., and in the case of a steam engine, the expense of hauling away the ashes, should all be included as a part of the cost of running the power plant, the total of all these various items makes up the cost of the power which must be distributed among the productive

centers on the basis of the horse-power hours.

To distribute the power bill against the productive centers or the individual machines in these centers, we first find the total of the horse-power hours of all the machinery in the plant. The total of the power bill is then divided by the number of horse-power hours to get the unit of cost per horse-power hour. In many cases it is advisable to use 5 or 10 horse-power hours as a unit of distribution on account of the greater simplicity in figuring. In either case the result will be the cost of the unit of horse power. Then multiply the horse-power hours of each productive center by this unit and this will give the cost of the power for that productive center. If it is desired to get the horse power cost for each machine in a productive center this can be done by a little further extension of the same method, that is by multiplying the unit cost of the horse-power hour by the number of horse-power hours of each individual machine.

When this work is completed again total the amounts of power to be charged against each productive center and see that this total equals the amount of the power bill. In many cases there will be a little variation as was

shown in the distribution of interest, insurance and taxes. This variation over or under the total power bill should be distributed between the productive centers, either adding to or deducting from the productive center which has been most active and is best able to stand the difference.

When this work is completed the power charge for each productive center can be transferred to the distribution blank under the proper column.

In many printing offices a portion of the machinery will be driven from one large motor while some few of the other machines will have individual motors. In such case, distribute the power cost of the large motor against the departments in horse-power hours and add to this the horse-power hours of the smaller individual motors, then distribute the entire power bill as shown above.

In many offices where a gas or gasoline engine or a large motor is used for the heavier machines, the typesetting machine is usually driven by an individual motor. In such offices this motor is very often connected up to the light circuit instead of the power circuit. So also in many offices a small machine like a

stitcher is also connected to the light circuit. Where this is done there would be no distinction in the bill from the electric company as between the light used and the power used for these light machines. These machines should, of course, be charged with the power which they use and this can be found as follows: Electric light bills are usually rendered at a specific price per kilowatt hour of the current used. The motor on a typesetting machine is usually one-fourth and that on a wire stitching machine is usually one-eighth horse-power. In either case you would find the horse-power hours by multiplying the power of the motor by the number of active hours the machine has been run as shown by the time records. Then multiply the horse-power hours of each of these motors by .746 and the result will be the number of kilowatt hours consumed as power for these machines. It will then only be necessary to multiply these kilowatt hours used as power by the price per hour as shown on the electric bill to obtain the amount to be charged against these machines for power. This amount should, of course, be deducted from the electric bill and the remainder entered as light on the cost distribution blank.

In the small plant used as an illustration the distribution of power under this plant would be worked out as follows:

The cutter, as an example, ran 32 hours in one month, the stitcher 16 hours, one job press 160 hours, the other 85 hours, and the cylinder 24 hours.

Multiplying these various hours by the indicated horse-power motors, shows the following results:

<i>Machines</i>	<i>Hrs. Run</i>	<i>Size of Motor</i>	<i>H. P.</i>	<i>Hrs.</i>
Cutter	32	×	4	= 128
Stitcher	16	×	$\frac{1}{8}$	= 2
Job press No. 1...	160	×	$\frac{1}{2}$	= 80
Job press No. 2...	85	×	$\frac{1}{2}$	= 43
Cylinder	24	×	3	= 72
Total				325

By centers the result would be as follows:

Bindery—Cutter	128
Stitcher	2
Total	130
Job press—Press No. 1.....	80
Press No. 2... ..	43
Total	123
Cylinder	72
Total	325

Each center is thus figured, and the total h.p. hours of the various machines are charged as a cost to each center. The cost of the power was \$13.00, and the unit of distribution to the various centers is found by dividing this amount by the total h.p. hours, thus:

$$\$13.00 \div 325 = .04$$

The result being a cost of 4 cents per h.p. hour, each center is charged on this basis, as follows:

<i>Center</i>	<i>H. P.</i>	<i>Hours</i>	<i>Cost</i>	<i>Totals</i>
Bindery	130	×	4c	= \$5.20
Job press.....	123	×	4c	= 4.92
Cylinder	72	×	4c	= 2.88
Total				\$13.00

The job presses are charged with a larger proportion of the power, because they are used more; the cylinder with less, because it is used less. This method has been adopted as the standard by all cost experts using the productive center method of ascertaining costs. The flexibility and justness can easily be seen by the examples shown.

One wonders why, under the old accounting methods, power was thrown into a general

hopper called "overhead," and tacked by percentages onto labor, material or something else, none of which had anything to do with the amount of power consumed. The direct cost method, the productive center idea, shows up with complete certainty as being correct, as each item of cost is analyzed.

The following will give a good idea of how to figure the cost of a privately owned power plant, the amounts being purely estimated, and the total brought to the same figure as used before for example only:

	<i>Cost per Month</i>
Rent for space occupied by engine.....	\$ 2.00
Fuel used	4.50
Oils, waste, etc.....	.50
Repairs	1.00
Labor	1.00
Interest on investment, replacement, etc..	4.00
	<hr/>
	\$13.00

When all the machinery is driven from one power unit the cost of running the shafting can be figured against the individual centers or ignored as an item, and each machine will bear its burden according to the hours run. Theoretically each 1000 pounds of shafting and pulleys absorbs a half-horse power, but

in many establishments, owing to the improper manner in which the shafting is hung and lined up, the power absorbed will often reach to a half more, or even double that amount. Belt friction and slippage also absorbs a very appreciable amount of power. Under average conditions this amounts to 25 per cent. For instance, a belt taking 2 horse power from the driving pulley will deliver but $1\frac{1}{2}$ horse power to the driven pulley.

Because of the intricate figuring required to properly distribute the power absorbed by shafting and belting it is the better plan, in most shops, to ignore this item as it will be fully cared for in the regular distribution of the power and the variation from the true cost on any one machine or center would be negligible.

These power losses through shafting and belting become a considerable amount in the course of a year and constitute a strong argument in favor of installing individual motors for each machine in the plant.

There are methods by which testing machines as to the h.p. required (with and without load) may be used and various other similar ideas, but when figured out the result is so very little

different from the h.p. hour basis, that it is a waste of time.

It must be remembered that in each case the running time, exclusive of make-ready of each machine is used as a basis for figuring the h.p. hours.

QUESTIONS

1. *In what way is power figured?*
2. *In how many different ways may power be secured?*
3. *In how many ways can power be figured when purchased direct?*
4. *How may meters be used?*
5. *What is h. p. hour?*
6. *How are h. p. hours found?*
7. *Give an example figuring h. p. hours.*
8. *Distribute cost to productive centers on the above basis.*
9. *What other methods may be used?*
10. *Can cost of privately manufactured power be found by productive centers?*
11. *Give example.*

VII

FIGURING LIGHT, TOILET AND ELEVATOR EXPENSE

Of all the expenses that enter into the cost of production, possibly these three have had the least attention of any other items. The small plant paid but little attention to them, as the combined cost of the three is very small, yet they constitute a factor, and however small must be taken into account in figuring costs.

Some cost systems still use the older method of light distribution which is therefore given here.

LIGHT—In a small office, or when the cost of light is less than \$50.00 a month, this can be very easily figured as a general expense, and will receive its final distribution to the various productive centers when that expense is taken care of.

When light costs more than \$50.00 a month, and runs into a considerable sum, a careful record should be kept of the amount used in the various divisions, including the office.

For example, we will assume that the cylinder press-room has done considerable overtime,

that the daylight was not good and that a great deal of electricity in the form of light was consumed. The other general productive centers may not have used very much, and therefore should not bear the burden of the increased cost of light.

The foreman of each department should send in a report each day of the number of lamps and the number of hours they were used. A press-room has forty lamps of 40-watt consumption per hour. Only twenty of these may be used, or perhaps thirty-five. It is a simple matter for him to report as to the consumption, and a blank modeled on the following lines will be found admirable.

Productive Center.....		
Date, 192.....		
No. lamps used.....	Size.....	Watts.....
No. hours turned on.....		
Signed		Foreman.

The cost clerk can keep the record of the lights used in the office in the same manner. At the end of the month, these slips may be

tabulated by multiplying the number of lamps by the size or watt, and the product by the number of hours they were in use. The following example will illustrate the point:

The center during the day used 52 lights for four hours, and the size of the lights were 40 watts, and the result is 8320 watts consumed, as follows:

$$52 \times 4 \times 40 = 8320 \text{ watts}$$

These are figured every day and totaled at the end of the month. Assuming that this amount was an average for 26 working days, the result would be:

$$8320 \times 26 = 216,320 \text{ total watts}$$

Electricity is sold by the kilowatt, and 1000 watts make a kilowatt. There were then 216 kilowatts consumed, which at 10 cents per kilowatt, would amount to \$21.60. All the centers can be figured in a like manner. This, however, is not absolutely correct. The only correct way is to install an individual meter in each center.

Where arc lights are used, the electric company will gladly furnish the information as to the watt consumption.

There are many other ways of figuring light, as on the basis of the number of lights

in each center, sold hours, pay roll hours, etc.

Many present day cost experts regard these older methods of light distribution as wrong because they result in penalizing the less important production centers which are usually located in the darker portions of work rooms.

The modern view is that every department is justly entitled to sufficient light for its operations and if it is so located that it does not receive enough daylight for that purpose it should not be loaded with the expense of artificial light because of its unfortunate location. These less important production centers usually carry a very high production cost because of the small number of hours they are operated. Such machines as stitchers, punches and perforators, for instance, stand unused for days at a time in many plants but the expense of rent, interest, insurance, depreciation, etc., keeps piling up 24 hours a day and so increases the hour cost of the center.

The most equitable way to distribute the cost of light is to include the light bill in the general expense to be distributed against all the productive centers. In this way the unimportant centers are relieved of the excess burden of light expense while the more active centers, owing to the greater number of their

productive hours, will not be unduly burdened and in fact the increment of light expense charged against them becomes so small that it does not materially increase their hour cost.

TOILET—In large plants this is quite an item of expense and the only proper method is to distribute the cost to each productive center according to the average number of persons in each center. The rent, water rate, supplies, soap, etc., should all be figured, and the total per person in the plant found, including the office force, and each center be charged with the proportion. The following illustration shows the method:

Rent	\$18.00
Water rate	4.60
Soap and towels.....	8.50
Supplies	2.50
Repairs	14.50
Plumbing expense	3.50
Total	<u>\$51.60</u>

The number of persons employed in the plant are as follows:

Office force	26
Composing room	164
Press room	214
Bindery	241
Total	<u>645</u>

The total expense being \$51.60 and 645 persons, the cost per person is 8 cents as follows:

$$\$51.60 \div 645 = .08$$

The cost is then distributed to the centers and office as follows:

	<i>No. of persons</i>	<i>Cost</i>	<i>Totals</i>
Office	26	$\times .08 =$	\$ 2.08
Composing room	164	$\times .08 =$	13.12
Press room	214	$\times .08 =$	17.12
Bindery	241	$\times .08 =$	19.28
			<hr/> \$51.60

In small plants the item of toilet expense can be considered a direct office cost, and this will later be absorbed by the various centers.

ELEVATOR—In the greater number of plants elevator service is part of the rent, and does not need consideration. In large plants it is quite an item, and must needs be considered individually.

The freight elevator is used almost entirely for handling stock, and the entire cost of running this elevator should be charged to stock handling.

There may be some argument here as to where the item of delivery to shipping room

comes in; but all this can come under the cost of stock handling, and should be so figured. The cost of stock handling will be considered later.

The cost of the passenger elevator and its method of distribution depends entirely upon the conditions of the building. If the office is on the ground floor, then the cost should be distributed to the centers according to the full number of employees. If the offices are located on the second or third floors, then they should bear the greater portion of the expense, as it will be used a greater percentage of the time for business purposes. The cost of the elevator service must be governed by circumstances, and carefully analyzed before a decision is made as to the correct method.

There are a great many plants that have several branches or departments, such as publications, directory departments, salesrooms, etc. A careful tab should be kept in each of these of the elevator service, and each charged with a just proportion of the cost of maintaining and running the elevators.

The usual items of cost are—power, repairs, inspection, elevator operator, greases and oils, and a liberal allowance for depreciation and

interest on investment, as well as its proportion of rent according to the floor space.

Those having special elevator problems should submit them to a cost expert for consideration and advice.

QUESTIONS

1. *What plants are most affected by the cost of light, toilet and elevator expense?*
2. *What is the minimum cost for light that should not be considered as an individual item under the old method of distribution?*
3. *State how light consumption by productive centers may be reported.*
4. *Should the consumption of light in the office be reported? By whom?*
5. *How is the amount of light used to be figured?*
6. *What is the modern method of caring for light expense?*
7. *How should toilet expense in large plants be figured?*
8. *Give an example.*
9. *To what should the cost of running a freight elevator be charged?*
10. *What is the difficulty in figuring the cost of the passenger elevator?*
11. *State how you would figure it.*

VIII DIRECT DEPARTMENT EXPENSES, SPOILAGE AND STOCK HANDLING

Each productive center has many items of expense that are wholly incidental to that center. In every case they should be made a direct charge and become a part of the cost of operating that center.

The true theory of cost is charging to each center every item of direct cost specifically and not by guesswork. In the productive center method every item of cost can be traced directly, and nothing left to be added by any method of calculation by a percentage based on something else. It is the direct method of debiting and crediting each center with what it costs and what it produces.

The items of direct expense that can be traced directly to each center are numerous, and the items in each plant differ from those of other plants, but the common items are enumerated, and the cost clerk should be careful to secure all the items of expense that can be charged directly to the centers.

There are a number of items of shop expense, such as rags, lubricating oil, gasoline, etc., which are used in two or more productive centers and are usually bought in bulk. The cost of these items should be charged, as direct department expense, against each productive center using them in direct proportion to the amount used. Mr. Robert F. Denham, a pioneer in cost finding for printing offices, puts it in this way: "Every expense in the printing business is incurred for some specific purpose and is of benefit to some especial process of production. All expense must be distributed and charged against the departments of the business directly in proportion to the benefits received by each."

COMPOSITION—The small expense items in this center are proof paper, twine, benzine or gasoline, ink, brayers, brushes, rags, lye, etc. When machines are used, there will be gas, supplies, oils, metal waste (about one per cent each time it is melted), paper and water (if monotypes) and repairs.

PRESS ROOM —In this center there are rollers, benzine or gasoline, gauge pins, tympan paper, smut sheets, oil, rags, repairs and other supplies. Ink is purely merchandise and

should never be considered as a productive center expense, but always as a direct cost against the job, the same as paper stock.

BINDERY—Here there are knife grinding, cutting sticks, gas, wire for stitcher, glue, paste, thread, folders, ink, alcohol, cleaning blankets for ruling machines, repairs and supplies. Gold should be a direct charge to the productive center that handles the finishing of books, etc.

No one thing is of more importance than getting all these small items into the cost of the productive center. The bookkeeper should give the cost clerk a full list and accounting of all these small items, so that they may be charged correctly and the cost clerk should consult with the different foremen as to the amounts used of such items as are used in two or more centers, such as oil, etc., unless some system of requisitions for these supplies is used. Especially is this true of repairs, which may be quite an item.

SPOILED WORK is an incident to all printing plants, big or little. Too many, however, consider only the cost of the stock. The cost of production up to the point where the error occurred should be considered a part of the

charge. A spoiled work ticket should be made to cover the job, entered upon the books of the company, and figured into the costs. A great many thousands of dollars have been lost to the printers of the country through failure to consider this important item. Printers who think they do not have it should wake up.

In some cost systems spoiled work is considered a direct expense and charged to the center making the error, so that the cost may be borne directly as an item of cost to that center. This theory is fairly good, and one that may be carried out, but it is not always easy to locate the origin of the error. Every man will prove an "alibi" if possible, and "pass the buck" to some one else. A great many errors are due to wrong instructions from the office, and as all the centers combined must finally bear the cost of the entire business, unless the spoiled work can readily be traced to a particular center, the cost of it should be entered as an office expense. In nine cases out of ten, spoiled work will have to be taken care of in this manner, and in the smaller plants this is the most practical way.

Modern cost experts take the view that, so long as human hands and brains are employed in business processes, errors will be made in all departments of either commercial or manufacturing businesses. This being true it follows that the expenses incurred through such errors are inseparable from the conduct of the business and should, therefore, be treated as an expense of the business as a whole, and, thus treated, spoiled work would become a part of the general expense and be distributed against all the productive centers in proper proportion.

Inasmuch as a large portion of the spoiled work in a printing office must be made a part of the general expense because of the impossibility of locating the center responsible for the spoilage it is much more logical for all to take the same course.

An excellent way to provide for this is to figure into the costs a fixed sum each month to take care of this—say one-half of one per cent of the total business, or a special ledger account may be carried to cover this, and all spoiled work be debited to this account. This is a safe method, and will prove successful in keeping an accurate account of this item of cost and leakage.

Another excellent idea is to provide a special ruled columnar book in which the bookkeeper may classify all direct expenses, so that the cost clerk may have them at hand when the time comes to figure the costs for the month.

STOCK STORAGE AND HANDLING

Until the productive-center method of figuring costs was devised, the cost of handling stock or stock storage was never considered.

The general method in use is to charge ten per cent for handling, but this, like all percentage methods, does not give true costs. It certainly costs about as much to handle 1000 lb. of ten cent paper as it does to handle 1000 lb. of fifty cent paper.

Waste, spoilage, chances of loss, etc., cannot be argued about as these are all provided for in other ways, and not in the cost of handling.

One of the leading cost systems provides that all the rent, labor and expenses of handling and storage of stock should be totaled and pro-rated, as a percentage, against materials used on the product.

In the smaller shops the handling of stock is usually carried into the bindery; or it simplifies matters to so arrange it.

In larger plants, however, considerable space and labor are expended in the handling, storage and delivery of stock.

If it is desired to know just how much it costs to handle stock, make this work into a sub-productive center. Charge it with such items as rent, insurance, taxes, labor, office and incidental expenses, etc., as may be proper. When this result is obtained, the costs can be ascertained in one of two methods.

As it has been suggested to add ten per cent to paper for handling, it may be well to prove the correctness of the theory. Having determined the total cost, it is merely necessary to ascertain from the bookkeeper the amount of the purchases in paper for the month; and the rest is easy.

For example, it has cost \$375.46 per month for rent, insurance, taxes, depreciation, etc., to run a sub-productive center for stock handling, and there has been expended \$3,254.65 on paper. The cost of handling the stock amounts to $11\frac{1}{2}$ per cent as follows:

$$\$375.46 \div \$3254.65 = .115 \text{ or } 11\frac{1}{2} \text{ per cent}$$

This method is, however, manifestly unfair

to the customer using the higher priced papers and equally unfair to the printer on the lower priced papers. For example, two jobs going through the shop at the same time and each using 10 pounds of paper, one at 15 cents and the other at 30 cents a pound; against one job, on the ten per cent method, would be charged 15 cents for stock handling and storage and against the other 30 cents. This is inequitable as the stock room cost would be the same for each 10 pounds of stock.

The logical method would be to find the pound cost of handling and storing all paper stock. A pound is a pound and its money value has no definite relation to the cost of handling and storage. This method requires a little more labor, but it is far more accurate.

Ascertain the total number of pounds of paper purchased during the month; the weight of the envelopes may also be included.

For example—It has cost \$375.46 to conduct the stockhandling center, and it is found by careful calculation that 75,092 pounds of paper were purchased during the month, and that it has cost .005 per pound to handle it:

$$\$375.46 \div 75092 = .005$$

If 1000 lb. of paper are used, it would cost, upon that basis, \$5.00 to handle it, whether ten-cent, fifteen-cent or forty-cent paper. This is the most accurate way, but requires a little more labor because it is necessary to ascertain the number of pounds of paper purchased during the month. This, with the exception of a few items, can be gathered from the invoices.

QUESTIONS

1. *Are there items of expense that can be charged directly to a productive center?*
2. *Is the theory of finding the cost by direct charges correct?*
3. *Does this method apply to productive center methods?*
4. *Give a list of direct expenses in various centers.*
5. *Give a list of those not included in this article.*
6. *Who should furnish a list of direct expenses?*
7. *Do you have any spoiled work?*
8. *Can the center at fault be readily found?*
9. *How should spoiled work be charged?*
10. *Does it cost money to handle stock?*
11. *Which is the more accurate method—to charge a percentage or a direct price per pound?*

IX

SALARIES OF FOREMEN AND SUPERINTENDENTS

The theory of a foreman is that he should oversee and direct the efforts of a number of men who are employed at a given task. He is not supposed to do any of the actual work, but to superintend it.

Many small plants, however, have "working foremen," who not only direct the work of others, but do a good share of it themselves.

In the matter of figuring the foreman's salary, or rather of distributing his salary against each productive center, there are two separate ideas—one, that of a "directing foreman" and the other a "working foreman," and each needs different treatment in the adjustment of salary.

The "directing foreman," as explained in the first paragraph, directs the efforts of a number of men at a given task. The men

under him, who receive the higher rate of wages, do so because the foreman finds that he need not pay as much attention to the work of these men as he does to that of the others; and the lowest paid man is the one who requires the most supervision.

In many shops the foreman directs the work in more than one productive center; for instance—in the press room with job and cylinder presses, or a bindery that has been subdivided into several productive centers. The foreman is a non-producer, but plays the highly important part of “director”—and his salary must be borne by the various productive centers of which he has charge.

His work is clearly with the individual, irrespective of the wage paid, and therefore the salary of the foreman cannot be distributed to the various productive centers according to the wages paid the various employees. This would be unjust to the man who is paid a high wage because he requires but little supervision, and would be clearly favoring the cheap employee who requires considerable supervision.

The productive center that employs the greatest number of people will need the most

directing, and the one with few people will require less.

Reasoning the situation out clearly, the salary of the foreman should be distributed according to the number of hours employees have worked in the various productive centers. Not chargeable hours, but actual pay-roll hours of the employees. To use the chargeable hours would not be just as the non-chargeable time often needs as much directing as the chargeable.

Referring back to figuring the pay roll (see page 4) you will note that the actual pay-roll time of every employee has been totaled for each productive center. Thus the number of hours put in by employees in each of the productive centers can be easily totaled, as follows:

	<i>Comp.</i>	<i>Cyl. P.</i>	<i>Jobbers</i>	<i>Bind'y</i>
John Richards ..	224.0	....	....	....
Chas. Edmunds		54.2	112.8	57.5
R. R. Hicks.....	214.5	....	....	....
Total for depts...	438.5	54.2	112.8	57.5

Thus we find that there are 663 pay-roll hours as follows:

92 HOW TO FIGURE COSTS

Composition	438.5
Cylinder press	54.2
Job press	112.8
Bindery	57.5
Total	663 hours

The foreman's salary is \$232.00 and this divided by 663 hours will amount to 35 cents an hour which is then divided on that basis among the productive centers as follows:

	Hours	Rate
Composition	438.5	$\times .35 = \$153.48$
Cylinder press	54.2	$\times .35 = 18.97$
Job press	112.8	$\times .35 = 39.48$
Bindery	57.5	$\times .35 = 20.12$
Total		\$232.05

The odd 5 cents should be deducted from the least active department, making cylinder press \$18.92.

Each center by this method has charged to it a just proportion of the foreman's salary, according to the amount of directing the center requires. A center that is comparatively idle needs very little directing, and the busy center needs more. Each center will be charged only as it needs demand.

The salary of the working foreman is taken

IMPORTANCE OF ACCURACY 93

much in the same way, except he will keep a time report and all non-chargeable time will be credited to directing, and this amount distributed among the various productive centers in his charge in the same manner as already shown. His productive hours to be credited to the center where produced and the proper proportion of his wage charged, as labor, against these centers.

There may be some question, however, as to the time of a working foreman in the composing room when he does distributing. The cost clerk will have to look out for this very carefully, and separate the directing time from the time actually spent in a productive center. A great deal of diplomacy and tact must be used when the working foreman is a member of the firm. By carefully making out time reports, and calling the attention of the foreman to the need of correct time, the desired result may be accomplished. But it will require persistent effort to do it. It is a sad commentary upon business men that they are particular about the accounting of every dollar, but lose track of the golden hours that bring in the dollars, and see but little need of accounting for them.

Where a superintendent is employed to take the management of a plant, and is in charge of several foremen, his salary should be charged equally against the various foremen, each foreman to be considered as a unit. The superintendent or manager handles the business through the foremen, and his salary should be disposed of through them and distributed to the centers in the same way as the foremen's wage.

This is, no doubt, a new idea on the subject, but when analyzed it may be seen clearly that it is a very logical way to distribute the superintendent's salary. As the foreman directs those under him, so does the superintendent direct the foremen. For convenience in figuring, the amounts may be added to the foremen's wage before charging to centers.

Should there be five foremen in a plant, and the superintendent's salary \$350.00 a month, one-fifth is added to the wage of every foreman as follows:

Foreman	Salary	Supt. Salary	Total
John Osborn	\$226.50	+ \$70	= \$296.50
Richard Johns	234.75	+ 70	= 304.75
Geo. C. Robinson.....	215.00	+ 70	= 285.00
Oscar Nelson	232.50	+ 70	= 302.50
Henry Vance	254.65	+ 70	= 324.65

These totals are then carried to the various productive centers of which the foremen have charge on the basis of the pay-roll hours, exactly as described before.

Another method quite commonly in use is to carry the superintendent's salary as a part of the administrative or office expense.

QUESTIONS

1. *What is a foreman?*
2. *How many kinds are there?*
3. *Should the higher paid employee bear a larger portion of the foreman's salary for directing?*
4. *Can a foreman direct in more than one productive center?*
5. *What productive center should be charged with most of the foreman's salary?*
6. *What is a pay-roll hour?*
7. *How can this be used to distribute the foreman's salary?*
8. *How is the "working" foreman's salary distributed?*
9. *What is the main difficulty in the time of a "working" foreman?*
10. *How should a superintendent's salary be distributed?*
11. *Why?*
12. *What other method can be used?*

X

SELLING EXPENSE

If one were to ask the average printer what his selling expenses were, he would stare in wonderment and probably say that he did not have any except his solicitor.

Yet every printer, however small, has some selling expense, and the list of the items that make up this expense is considerably more than the amount paid to a solicitor.

The following items are a few of those that go to make up the selling expense:

- Salaries of salesmen and solicitors
- Commissions for orders
- Traveling expenses
- Car fares
- Advertising
- Telephone and tolls
- Telegrams
- Discounts to customers
- Deductions to customers
- Bad accounts

Donations and charity
 Organization dues
 Office stationery
 Postage
 Being a good fellow

Perhaps there are more. All these are closely related to sales, and must be considered a selling expense. Each will, upon careful analysis, be found a true selling expense.

Salaries of Salesmen and Solicitors—There is no question but that these are selling expenses, especially if they are working on a straight salary and not upon a percentage basis.

Commissions for Orders—This item should be figured into selling costs as a lump sum, especially with the idea of one order being a leader to many. If commissions are given occasionally, this is correct. If, however, all the salesmen, solicitors, etc., are absolutely on a commission basis, then these two items must not be figured into costs, but the commission added as a direct cost to each job or item from which the salesman derives a monetary return. The only correct method of handling this proposition is to obtain a factory cost, and then add the commission. This

should be handled very carefully, and not attempted except upon expert advice, when all the circumstances have been fully taken into account. The average plant, however, does not do business in that way, and hence all salesmen's costs should enter directly into all the productive costs.

Traveling Expenses—These are almost always related to sales, and are a selling expense.

Car Fare—This is mostly street car fare, and large orders often mean many trips. Small orders will mean few. This is clearly a selling expense.

Advertising—No one will question this as a selling expense, and if the advertising is produced and mailed from your own plant, the full cost of this advertising must be charged. Do not make the mistake of thinking that your own printing costs nothing. Charge into selling expense the full cost just as if it were produced for someone else. No greater loss has there been than this one, especially to printers. The merchant and manufacturer has to pay for his advertising matter, which enters into his cost of doing business and because it is done for your business does not eliminate the value of it; so why not figure it into the cost of doing business?

Discounts to Customers—Many give discounts, and take discounts, and foolishly try to balance one with the other. A discount may be given, not only for prompt payment, but to win trade, to sell the goods. Every discount given is a selling expense, and should be figured into the costs.

Deductions—The same argument in relation to discounts holds good with deductions to customers. They are given to hold business, or as a means of securing a future order. Thus they become a selling expense.

Bad Accounts—Uncollectible accounts should be held down to a certain percentage of sales. They are an incident of selling.

Donations and Charity—often called "hold-ups"—are usually given because of some pull, that may result in either getting business, or loss of business when turned down. They are a selling expense, and are usually held down to a certain percentage of sales.

Organization Dues—These are usually for membership in trade organizations for betterment of business methods and larger profits, and hence have a distinct relation to sales.

Office Stationery and Postage—A necessity, but almost entirely used to produce sales, or

the necessary correspondence before, during or after the production of work.

Telephone, Tolls, Telegrams, etc.—These modern necessities are used almost exclusively in the promotion of sales, and are clearly a selling expense. How often are they used for anything beside the actual business connected with either a possible order, or an order in the house? They facilitate selling, and are, therefore, a selling expense.

Being a Good Fellow—Last but not least are the hundred and one small costs of getting on the right side of a customer, treating him right and holding his business. And the customer must pay—who else should?

These are the general selling items, and must be figured into the cost of production.

There are two ways in which they can be figured into costs, a great deal depending upon the size of the plant and method of doing business.

For a small plant these items may be safely figured into the "office" expense, and then distributed to the various centers, as will be described later. This method is advised for the medium and small plants, as the method to be described later will make but very little

if any difference in the hour costs in their plants.

The plant doing a business of \$20,000 a year or more, however, has a very much larger selling expense, enters into more productive centers, and it would be unfair to charge the selling expense as a direct office cost.

Selling expense is based on total sales, and therefore each center should bear as a selling expense its just burden according to the sales of each center.

The easiest and most correct method is to figure the basis of the cost of sales without profit or loss (which are always a percentage of cost) and then distribute the selling expense on that result.

For example, assume that the selling expense of a plant is \$104.82, and is to be distributed to the composing room, cylinder and job presses and bindery. If there were more centers, the principle would still be the same.

The composing room produced 265 chargeable hours, the cylinder press 51, the job press 106, and the bindery 56. The basis upon which the production of this plant sold its product was \$2.40 an hour for composition, \$3.00 an hour for cylinder press, \$1.60 an hour

for jobbers, and \$1.60 an hour for binding. Either profit or loss on work was a percentage of the total cost as based on these rates.

In other words, they were the extension values that are used in figuring the cost of work and as a basis of selling. Therefore the selling expense may be safely distributed to the various productive centers on a basis of this cost, which is the chargeable hours multiplied by the extension rates. The result is as follows:

<i>Department</i>	<i>Chargeable Hrs.</i>	<i>Extension Rate</i>	<i>Values</i>
Composing room	265	× \$2.40	= \$636.00
Cylinder press	51	× 3.00	= 153.00
Job press	106	× 1.60	= 169.60
Binding	56	× 1.60	= 89.60
			<u>\$1048.20</u>

The total selling expense is \$104.82, and the sales are \$1,048.20, which is ten per cent as follows:

$$\$104.82 \div \$1048.20 = 10 \text{ per cent}$$

The various centers will therefore carry ten per cent of the selling expense, based on the extended values of their chargeable hours as follows:

<i>Department</i>	<i>Extended Values</i>	<i>Per cent of Sales</i>	<i>Totals</i>
Composing Room . . .	\$636.00	× 10% =	\$ 63.60
Cylinder press	153.00	× 10% =	15.30
Job press	169.60	× 10% =	16.96
Bindery	89.60	× 10% =	8.96
			<hr/> \$104.82

This method simply, accurately and positively charges to each center a due proportion of the selling expense, based on the total sales for the month of each productive center. They are made a direct charge, and only according to the sales. A center that produces very little should be charged with little selling expense, while the center that produces the most should bear the greater burden.

QUESTIONS

1. *Has a printer any selling expense?*
2. *What is selling expense?*
3. *Describe the items and tell why they are a selling expense.*
4. *How should commissions be handled?*
5. *What two ways are advisable in which to distribute cost of selling?*
6. *Upon what is cost of selling usually based?*
7. *How can this be applied to printing?*
8. *What is an extension rate?*
9. *Show how selling expense can be distributed on extension values.*

XI

ADMINISTRATION EXPENSES AND COMMERCIAL INVESTMENT

One, in figuring costs, almost reaches the belief that "Things that are not—is." So many elements enter into the figuring, and can be traced to cost, that never were put into the "general expense" account, and each is so vital to commercial success that no wonder "labor costs" only were thought of in the early days of cost finding. Usually a lump sum of 25 per cent or $33\frac{1}{3}$ per cent was supposed to cover the "expense of doing business," and then let it go at that. But many a concern went broke on that principle, and the cost student dived deeper for the reason.

Having figured rent, interest and replacement, insurance and taxes, power, light, direct expenses, wages, and selling expenses, one would think that should complete the list, but there are other items of cost that are at times ignored, yet must be worked out if the business is to be a commercial success.

One of these items is executive salaries, or to call it by a less high-sounding name, the boss's salary. Few proprietors think of their own salaries, yet they are a part of the cost of conducting the plant, and the proprietor is entitled to a salary for his efforts, and a profit besides. He must secure a living, and to assure it he must figure it into his costs just the same as wages or salary paid to other employees. The owner usually works for the business, as such, and so stands, in relation to it, as an employee.

This is but one of the administrative expenses of a business. The others are bookkeepers, cost clerks, stenographers, office, messenger and delivery boys, office supplies, books of account, etc. These in a large plant amount to quite a sum, and should be figured as a direct office expense, and distributed to the various centers, as will be explained in the next article.

Not all of the money necessary to conduct a plant is invested in machinery and office furniture or equipment alone. Of the total capital invested in a plant, perhaps only three-quarters and often only one-half is thus invested.

Too often men start in business thinking

they need only a building, machinery, etc., and are then ready to start. This is not a start in the business world on a proper basis, and very soon the individual wakes up to the fact that credit plays a big part, and he will need money for running expenses, or credit to carry him along until he can secure a return in money on work done.

The well-managed concern always has a working balance, and does not hesitate to secure a loan, so that the working balance will be at hand in case it is needed. It requires money to pay interest, and if a printer does not pay interest on borrowed money, he would have to use his own money, and in that case is just as much entitled to interest as the bank would have been had it loaned him money.

Now this, in the business world, is called "commercial investment," or "working capital," and covers money invested in the business other than in equipment. It makes no difference if the money has to be borrowed to take care of this or if the proprietor has that much surplus invested—it must bring a return. It is used to make certain a reasonable return on the money invested.

In order to guarantee a sure and safe return

of this money, it is necessary to figure it into the cost of the business. To neglect to do so, may mean commercial failure. There are some who say this should come out of the profits; but they are taking a chance on a possible profit, whereas there is no chance connected with costs.

The general items on commercial investment are:

- Interest on cash and bank balances
- Interest on accounts receivable
- Interest on work in process
- Interest on paper stock and merchandise
- State, federal and corporation taxes

The first item may startle somewhat, but most banks require a certain balance to secure accommodations, and this is money invested in the business.

The accounts outstanding represent money expended in production, the owner is not being benefited by the use of that money, which might be invested elsewhere and secure an interest return on same. If customers wish to be carried, they should pay for the privilege, and as it is wise to make sure of receiving it, the interest on the monthly balance of accounts receivable should be figured into the costs.

This means at 6 per cent the sum of one-half of one per cent on the balance of accounts receivable at the end of the month.

The work begun, but as yet incomplete, has tied up a lot of money. It is in the nature of accounts receivable, but does not appear on the ledger. With a cost system, it is but the work of a few minutes to go through the job record sheets, add up all the time and material charged to unfinished work, and figure one-half of one per cent of this into the commercial investment expense.

Money invested in a stock of paper or other merchandise awaiting a purchaser is entitled to interest on the amount invested as well as investment for any other purpose. In the large cities, the average printer carries very little paper or merchandise that his unfinished work would not cover. In the inland towns, however, the situation is different, and a considerable stock of paper must be carried to meet the demands of the trade. On this the proprietor must get a return on the money invested. A perpetual inventory can be easily kept, and the average balance at the end of the month will give the proper amount on which to compute the interest as above.

If you pay state, federal or corporation taxes, these taxes should be included as a commercial investment expense.

Many believe that if the business owes any money on open account, this should be deducted from the total, as interest is not being paid on that money, and as it is not the firm's money, therefore, interest should not be figured on something not invested or borrowed from a bank, and on which the business is paying interest.

With this method commercial investment interest may be figured as follows:

Cash and bank balance.....	\$ 250.00
Accounts receivable	560.00
Work in process and merchandise....	275.00
	<hr/>
	\$1085.00
Less accounts and bills payable.....	595.00
	<hr/>
	\$ 490.00
Interest at one-half of one per cent....	2.45
Federal and corporation tax, 1/12 of the whole amount.....	.50
	<hr/>
	\$ 2.95

It is recognizable that the fewer the accounts payable, the greater the amount to be

figured for interest, as there will be a greater amount invested in the business.

The amount should be charged direct to office expense, except in extremely large plants, and then distributed on the basis of total departmental costs as explained later.

QUESTIONS

1. Have all the items of cost been figured in the general expense?
2. What are the usual expense items?
3. What item of expense is sometimes forgotten?
4. What are administrative expenses?
5. Is money invested only in equipment?
6. Why do many men start in business on a false basis?
7. Why commercial investment?
8. What items should bring interest as a commercial investment?
9. Give your own opinion on the subject of outstanding accounts and unfinished work.
10. What about accounts and bills payable?
11. Give an example of figuring commercial investment.

SUMMARY OF COSTS BY PRODUCTIVE CENTERS.

ITEMS	OFFICE	COMP.	CYL. PRESS	JOB PRESS	BINDERY	TOTAL
Plant investment.....	\$251.65	\$1246.32	\$1502.85	\$941.84	\$651.84	\$4594.50
Floor space (50 ft. units)...	4	4	3	2	3	16
Power basis.....	.....	.....	72	123	130	325
Pay roll hours.....	.....	438.5	54.2	112.8	57.5	663
Chargeable hours.....	.....	265	51	106	56	478
Extension rates.....	.....	\$ 2.40	\$ 3.00	\$ 1.60	\$ 1.60	1048.20
Extension values.....	.....	636.00	153.00	169.60	89.60	
Pay roll.....		\$ 416.10	\$ 43.36	\$ 90.24	\$ 46.00	\$ 595.70
Building Expense.....	\$ 20.00	20.00	15.00	10.00	15.00	80.00
Plant investment exp.....	3.94	19.72	23.64	14.97	10.24	72.51
Power.....	.....	.....	2.88	4.92	5.20	13.00
Selling expense.....	104.82	.....	.....	.....	.....	104.82
Office salaries.....	124.00	.....	.....	.....	.....	124.00
Light.....	2.16	.....	.....	.....	.....	2.16
Spoiled work.....	6.42	.....	.....	.....	.....	6.42
Direct dept. expense.....	.....	1.69	2.16	1.35	1.15	6.35
Commercial investment.....	2.95	.....	.....	.....	.....	2.95
Foreman's salary.....	.....	153.48	18.92	39.48	20.12	232.00
Totals.....	\$264.29	\$ 610.99	\$ 105.96	\$160.96	\$ 97.71	\$1239.91

112

*All above this line are "statistics" on which are based the various amounts.

XII

OFFICE EXPENSES

We have now come to the finishing touch of the Cost System. Every conceivable item of expense has been provided for, and each distributed and placed in its proper position and where its presence can be properly explained.

If you will go back to the previous articles, and place all the problems figured out—with a very few exceptions that did not quite fit into the general plan and were given mainly as illustrations—you will make out a sheet about like the one on page 112.

You can easily trace each item, and read back what each means, and after you total it all up, you will come to office expense, which is largely administrative and selling cost, and wonder what in the world you are to do with that \$264.29. There are several ways in which it is possible to distribute this sum to the various productive centers, and

113

without prejudice each method will be shown and carefully analyzed with examples showing methods of figuring and results.

SOLD HOUR METHOD—This method is the distribution of office expense to the various centers according to the number of sold (chargeable) hours to each productive center.

Argument—The sold hour represents the effort that has been put forth to produce. The center that has not produced should not be charged with any of the office expense. The sold hour is the unit of cost, and must bear the burden. It provides for elasticity, in that busy departments carry the greater portion of this expense. There is a logical and direct relation between the hours sold and the selling and administrative cost of selling them and collecting and accounting for the selling price.

Example—There are in all 478 sold hours (or chargeable hours) and the office expense is \$264.29, and this divided by the sold hours gives the result of nearly 55.3 cents per hour for office expense as follows:

$$\$264.29 \div 478 = .553-$$

The office expense is then distributed to the productive centers as follows:

<i>Center</i>	<i>Sold Hrs.</i>	<i>Cost</i>	
Composing room	265	× .553	= \$146.54
Cylinder press	51	× .553	= 28.20
Job press	106	× .553	= 58.61
Bindery	56	× .553	= 30.96
			<hr/> \$264.31

This is 2 cents in excess of the correct sum, as the cost is less than 55.3 cents. This amount is usually deducted from the centers doing the least work, and then added to the cost of the centers as follows:

	<i>Comp.</i>	<i>Cyl.</i>	<i>Jobbers</i>	<i>Bind'y</i>
Center cost	\$610.99	\$105.96	\$160.96	\$ 97.71
Dist. office expense..	146.53	28.20	58.61	30.95
Total	<hr/> \$757.52	<hr/> \$134.16	<hr/> \$219.57	<hr/> \$128.66

Having thus distributed office expense to the productive centers, and added the direct center cost and office cost, the total department costs are found, and it is only necessary to divide these costs by the sold hours to obtain the cost per sold hour of the various productive centers.

<i>Center</i>	<i>Total Cost</i>	<i>Sold Hrs.</i>	<i>Cost per Hour</i>
Composing room	\$757.52	÷ 265 =	\$2.86—
Cylinder press	134.16	÷ 51 =	2.63
Job press	219.57	÷ 106 =	2.07+
Bindery	128.66	÷ 56 =	2.30—

The real hour costs as shown by this method have now been ascertained. For the small office this method is ideal and practical, and many larger shops believe it to be accurate.

However that may be—and the writer's personal opinion is not considered—there are other methods that the cost clerk should know, and we present them here. They are fully explained, and the reader may take his choice.

TOTAL DEPARTMENT COST—By this method the office expense is distributed on the basis of the total cost of each productive center as indicated by totals of summary of cost table exclusive of "office" column (page 112).

Argument—The direct cost of each of the centers are the factors of cost, and being such, office expense should be figured on that basis. The production cost of an article for sale is ascertained, and the "administrative overhead" cost added to give the gross cost before profit can be added. The direct center cost repre-

sents factory cost, and office expense should be distributed to each center on that basis—the hour cost can then be found.

Example—The total cost of the centers are ascertained, and then the percentage of office cost to the productive center cost ascertained. The total center cost is \$975.62, and the office cost is \$264.29, which is 27 per cent as follows:

$$\$264.29 \div \$975.62 = 27+\%$$

The office expense is distributed according to this result as follows:

<i>Center</i>	<i>Cost of Center</i>	<i>Percent Office Exp.</i>	<i>Total Dept.</i>
Composing room	\$610.99	× 27% =	\$164.97
Cylinder press	105.96	× 27% =	28.61
Job press	160.96	× 27% =	43.46
Bindery	97.71	× 27% =	26.38
			<u>\$263.42</u>

This is 87 cents less than the office expense, which amount is added to the centers with the highest production.

These amounts are added to the direct center costs as follows:

	<i>Comp.</i>	<i>Cyl.</i>	<i>Jobbers</i>	<i>Bind'y</i>
Direct center costs...	\$610.99	\$105.96	\$160.96	\$97.71
Dist. office expense..	165.55*	28.61	43.75*	26.38
Total	\$776.54	\$134.57	\$204.71	\$124.09

The sold-hour costs are then found by dividing the total center costs by the sold or chargeable hours as follows:

<i>Center</i>	<i>Total Cost</i>	<i>Sold Hrs.</i>	<i>Cost per Hour</i>
Composing room	\$776.54	÷ 265	= \$2.93
Cylinder press	134.57	÷ 51	= 2.64—
Job press	204.71	÷ 106	= 1.93+
Bindery	124.09	÷ 56	= 2.22—

This is the method adopted by the American Printers Cost Commission and perhaps more universally used than any other. The general result in large offices is to reduce the bindery hand work, such as folding, and increase the cost of composition and cylinder press work.

EXTENSION VALUE—While both the sold-hour and department cost methods have strong advocates the theory of distributing office expense on the basis of the extended values is being used as a compromise.

*Fifty-eight cents is added to the composition and 29 cents to the job presses to equalize the cost.

Argument—The office expense is largely created in making sales, and the sales are based on the value at which the product is sold, therefore the office expense should be distributed to the various centers, according to the extended values of the sold hours.

This is practically the method described in "Figuring Selling Expense," but for comparison the example of how this works out is given here:

Example—Refer to "Figuring Selling Expense," and the total value of the extended rates of the sold hours will be found to be \$1048.20. The office expense is \$264.29, which is 25.2 per cent as follows:

$$\$264.29 \div \$1,048.20 = 25.2\%$$

The office expense figured on this basis gives the result as follows:

<i>Center</i>	<i>Ext. Values</i>	<i>Percent</i>	<i>Office Exp.</i>	<i>Totals</i>
Composing room	\$636.00	× 25.2	=	\$160.27
Cylinder press	153.00	× 25.2	=	38.56
Job press	169.60	× 25.2	=	42.74
Bindery	89.60	× 25.2	=	22.58
				<u>\$264.15</u>

This is 14 cents less than the exact sum, and this amount is added to the most active centers to equalize the office expense.

The direct center costs and the office expenses are then added to get the total center costs and the result is as follows:

	<i>Comp.</i>	<i>Cyl. P.</i>	<i>Jobbers</i>	<i>Bind'y</i>
Direct center cost ..	\$636.00	\$153.00	\$169.60	\$ 89.60
Dist. office expense..	160.37*	38.60*	42.74	22.58
Total	\$796.37	\$191.60	\$212.34	\$112.18

The sold-hour costs are then found by dividing the total center costs by the sold or chargeable hours as follows:

<i>Center</i>	<i>Total Cost</i>	<i>Sold Hours</i>	<i>Cost Per Hr.</i>
Composing room	\$796.37	÷ 265	= \$3.01—
Cylinder press	191.60	÷ 51	= 3.76—
Job press	212.34	÷ 106	= 2.00+
Bindery	112.18	÷ 56	= 2.00+

These three methods are the ones most used, and to the cost student they present many interesting points. They are presented without recommendation, as each is adaptable according to the plant and conditions.

Two other methods are as follows:

PAY ROLL—A few use the pay roll as a basis for distribution of office expenses, in-

*Ten cents is added to the composition and four cents to cylinder press to equalize the office expense.

cluding foreman's salary, etc. The general principles of total direct center cost are used, except that the total pay roll of each center is the basis of distribution. Many plants have departments with piece workers, and this method is used in these cases.

PAY ROLL HOURS—The method used is the same as the sold hours, except the total pay roll hours of each center are used instead, otherwise there is no difference. The argument is that the non-chargeable time should bear a burden of the cost, and therefore the total pay roll hours plan is most equitable and logical.

It is well to bear in mind, however, that in some centers the non-chargeable time is only 20 to 25 per cent of the pay roll hours while in others it may run as high as 40 to 50 per cent, while in some combination newspaper and job plants the cylinder press, being used for little else than newspaper work the percentage of non-chargeable time may be as high as 50 per cent of the pay roll hours constantly.

The writer has tried to present plainly each step in figuring costs by productive centers as it is done in a printing office. There is no reason why this same method could not be

used in every class of manufacturing plant, with but slight changes.

The cost clerk, with the examples given here, should have no trouble in figuring the monthly summary of costs on form shown as summary of costs by productive centers (page 112) or an adaptation.

The entire blank should be cross-added and proven to be correct before the result is accepted.

Remember, accuracy is the chief point in figuring costs. The future of your business is in your hands; it all depends upon results, and an error may mean loss of business and complete failure.

QUESTIONS

1. *Can each item of expense be traced and charged against the right productive center?*
2. *What shall be done with the office expense?*
3. *What is the sold hour method?*
4. *Give an example.*
5. *What is the extension value method?*
6. *Give an example.*
7. *What is the Standard method?*
8. *Give an example.*
9. *What is the pay roll method?*
10. *Where is this used?*
11. *What is the pay roll hour method?*
12. *Wherein does it differ from the others?*
13. *What one thing is the most important to all cost keeping?*

XIII

ANSWERS TO QUESTIONS

There are any number of important questions that may arise in the figuring of costs, most of which apply to individual cases, or exceptional cases only. During the past few years many questions, some important, and others not so important, have been asked me, and I have felt that this book would be incomplete without adding to it answers to some of the most important questions asked.

Advance proofs of this book have been sent to several critics, mainly to learn if anything important had been omitted. Attention was called to several minor matters, and some took exception to certain methods shown. I also can take exception to some given, but in most cases I have presented what was the latest method, and, when possible, two ways to figure a certain item, wherein either way would not make any great difference in the result.

The appended questions and answers must not be considered primarily a part of "How to Figure Costs," but rather a help in seeking light on certain problems that have arisen. I believe they will be a great help to the student of costs and to the cost clerk.

WAGES PLUS OVERHEAD TO SECURE COSTS

QUESTION—*I have been very much interested in the Cost Calculator issued by Mr. George Benedict of Chicago, where he uses wages as a basis of figuring hour costs. Some of my friends state that the results he shows are exceedingly accurate. Can I safely use this Calculator for my costs, and thus figure what I make or lose on my job work?*

M. O.

ANSWER—I want to say that Mr. Benedict deserves a great deal of praise in getting out the Cost Calculator of which you write. I am not an admirer of costs based on wages, but Mr. Benedict has added some new features, and his results in general coincide with those secured by the productive center systems. But to use the figures given as a basis of cost, or instead of a cost system, without attempting to prove them correct as applied to a plant, is a pretty dangerous proceeding.

I grant that one may not go far wrong, and possibly as a basis of figuring, the Calculator is a mighty good thing. It is a long way better than using no method at all. You will have to accept, however, the figures given as true.

Mr. Benedict has based his figures on the proposition that the average workman produces but 40 hours a week, or rather, out of the total hours worked, but 40 are sold. This amount he has been able to arrive at by figures furnished from those operating productive center cost systems.

As a matter of fact several centers produce more than 40 hours a week for each workman, and others much less. The average, however, is nearly the amount given by Mr. Benedict.

The total expense of running a plant—less interest on investment and replacement—is found and compared with the total productive wages paid workmen. The surprising fact is that the amounts seem about even in nearly all plants. You can ascertain if this is true in your plant by adding up your general expense and then the wages paid and find the proportion. The following example will give an idea as to how this should be done.

Productive wages	\$595.70	
Rent, etc.	\$ 80.00	
Power	13.00	
Selling expense	104.82	
Light	2.16	
Spoiled work	6.42	
Department expenses	6.35	
Office salaries	124.00	
Commercial investment	2.95	
Foreman's salary	232.00	571.70
Total expenses	\$1,167.40	

Wages are 51 per cent of the expense, as follows:

$$\$595.70 \div \$1167.40 = 51 + \%$$

These figures are taken from the summary sheet on page 113 and show how closely wages and expenses are related. Nearly every printing office will be astonished as to how close the figures will come to being of equal amount.

On this basis of fact that the expenses are nearly equal, Mr. Benedict doubled the wage of the workman, and divided the weekly wage by 40 hours, and thus got the cost-hour wage.

Example—A workman is paid \$20.00 a week. This amount plus the percentage of other expenses makes the wage \$40.00 a week. This

amount divided by 40 hours gives the result as \$1.00 an hour.

Therefore, a workman being paid the wage of \$20.00 a week, it actually costs \$1.00 an hour for his time, but this is without his using a single piece of equipment of any nature. There is no interest on investment or replacement included in the amount whatever. How then is this amount cared for? Here is where Mr. Benedict is entitled to a great deal of credit. He has made up his table with the various wages paid, and by a simple method, the interest and replacement is taken care of by adding \$2.00 a week to the wage of each man, per \$1,000 worth of material or machine that he uses. And again the figures are astonishingly near correct as an average.

A machine worth \$1,000 would be charged with \$60.00 interest a year, \$100.00 replacement, and about \$48.00 in taxes, repairs and other incidentally amounting to \$208.00 a year, or for 52 weeks at the rate of \$4.00 per week. As the wages of the workman are doubled, thus by advancing the scale \$2.00 a week the \$4.00 a week for these items is taken care of.

Should, however, the productive time fall below that of 40 hours for each workman, then the product would be sold at a loss.

Using any such system will not tell what departments are costing too much, or where the big losses may be. It is good only as an *average* condition, but is far from being absolutely accurate.

I am glad to answer this question, as there may be some misunderstanding in regard to what I have said about basing costs according to the wage paid workmen. As a matter of fact, the Cost Calculator may have to be changed in a few years, when results from the productive center cost systems show that it is not correct. The Calculator is based on results from productive center systems, and this is what makes it so nearly correct. Without this proof, however, the Calculator would not be of much value.

There is no disguising the fact that high wages are paid to men who operate large machines, using a large floor space, and otherwise generally in proportion to the wages paid. The cheapest help is in the bindery, where very little floor space per employee is used, and where a foreman supervises the work of a large number of people. This condition is what makes possible the seeming accuracy of the Calculator. The only place it

may go wrong, is where there are varying wages paid in the same center, and an hour rate used there according to individual wages paid. This may lead to inconsistencies, and should be avoided. The proper way would be to average the wage paid, and thus find an hour cost.

Trouble may be found in the press center, where there are, say, four feeders and a pressman. Too low a cost may be gotten here, as the total productive hours of the five may not average 40 hours a week. I believe the wage of the pressman should be added to the wages of the feeders and then an hour cost found. If the pressman receives \$32.00 a week, and the feeders \$20.00 each, the pressman's wage should be divided among the feeders, thus making each \$28.00. This would give an hour cost of \$1.40, without investment, which is about \$500.00 per employee, making 5 cents an hour more, or \$1.45 an hour.

A great deal more could be written on this question, but enough is given here, so that the problem will be understood, and if desired, one can figure out a means of using this method of ascertaining costs.

OUTSIDE WORK

QUESTION—*Every printer has a greater or less amount of work he sends to someone else to do, and I claim that this ought to be handled in a separate department (or productive center). My plan has been to take the total of the bills paid for outside work, and treat them just as I do the known outlay for an interior department. I would be glad to hear from you in regard to this point.*

C. F. C.

ANSWER—The purchase of outside work, such as binding, engraving, machine composition, etc., can be very easily treated as a separate productive center. The group method of figuring costs helps a great deal in this problem. If a storeroom is used, a certain portion of the rent may be charged to that productive center. Then the office and selling expenses can be pro-rated against that center and the others according to the amount of business done and goods purchased. For instance: Goods to the amount of \$1,000 were used during the month, and the cost of operating the mechanical productive centers was \$3,000, both will total \$4,000. If the total office and selling expenses were \$400, then one-fourth or \$100

would be charged against merchandise, and three-fourths or \$300 against the mechanical centers. This amount should be added to the cost of the merchandise by percentage or otherwise.

One leading cost system provides that all the cost of handling stock shall be distributed against the hour costs. The other productive center methods do not do this, and usually create stock-handling centers, which is practically what is given above.

If a stationery store be run in connection with a printing office, care must be exercised in separating the different items of expense in order that the store shall bear a just burden of the cost, otherwise it will show a big profit and the printing office a loss.

SUPERINTENDENCE ONCE MORE

QUESTION—*Your method of dividing the superintendent's salary according to the number of foremen does not seem to be right. Should not his salary be distributed according to the number of people in each center, or according to the number of pay-roll hours? To my mind this is the best and most practical way.*

E. P.

ANSWER—You speak of "your method"

when as a matter of fact it is not my method at all. The question of superintendence came up in a large plant some time ago, and several methods were discussed as to the right one to use. Finally careful tab was kept on the superintendent's time, and it was decided that he gave about equal time to each of the foremen under him, and then his salary was added to that of the foremen pro-rata. The same proposition has come up several times, and when carefully analyzed this method was used.

Should you desire to use the pay roll method, or any other, I can see no objection. You will find that it makes little if any difference in the hour costs, whichever method you use. It does not pay to split hairs. Adopt a practical method, and then stick to it.

A NEWSPAPER-JOB SHOP COMBINATION

QUESTION—Shall I create a separate center for my daily and weekly newspaper, and find out the cost in that way, or what method is the best to pursue?

W. M.

ANSWER—If your newspaper is conducted independently of the job plant, by another force of workmen, I would advise creating several productive centers, such as, machine composi-

tion, ad. composition, make-up, press, stereotyping, mailing, etc. Have a regular tracer made out each day and get the total cost for the paper each issue. This is the best way.

One publisher makes out a tracer for each ad. and gets the cost of setting each ad. separately. He then secures the cost of each issue of his paper without the cost of setting the ads. This has given him valuable data, and changed a great many notions he formerly had as to what to charge for his advertising.

Where there is a combination job and newspaper office, a regular ticket should be made out, and the cost of each issue of the paper ascertained the same as though it were an outside job. At first, several publishers used a separate center, and paid but very little attention to the paper, as they wanted the cost system principally for the job end. After a while they began to keep costs on each issue of the paper, and then discovered quite a few interesting things. This is the only practical method and gives a great deal more valuable information.

COST OF ADVERTISING

QUESTION—*How shall I find out what it costs for an inch of advertising in my paper?* L.A.

ANSWER—This is a very mooted question at the present time, but I believe the correct way is to figure the mechanical cost of the paper, as shown by the cost system, add to that the cost of ready prints or print paper, plates, special features, editors' and reporters' salaries, and other incidental items. These will give the gross cost of the paper.

Deduct from this the amount received each week from subscriptions, reading notices, and legals. This leaves a balance that the advertising must cover, if you are to get back what you put into the newspaper. Divide this amount by the number of inches of display advertising that you run, and the result will give you a flat cost per inch for your advertising.

This method is still the one in general use and was originally used and adopted by the Cost Committee of the Minnesota Editorial Association.

A more logical method of finding advertising costs is gradually gaining the endorsement of newspaper publishers. In the past

the subscribers have never paid their just share of the expense of producing the newspaper largely because the publisher has gone on the principle that there was no money in the subscriptions anyway and that if they paid for the white paper it was all that could be expected.

This method of arriving at advertising costs is on all fours with the method previously mentioned in that the getting out of each issue of the newspaper is handled the same as though it were an outside job. The cost of the stock and other merchandise should be found in the same way as for other work.

Find the cost of the paper used for the issue and to this amount add 3 to 5 per cent for wastage and 10 per cent for handling and storage. To this should be added the cost of the ink, for an 8-page 6-column sheet, about 25 cents for the first thousand copies and 15 cents for each additional thousand. Add also the cost of plates, engravings, special features, etc., the labor cost of editorial and reportorial time, newspaper postage and other direct expenses that are properly chargeable to the paper. These items make up the merchandise and direct expense cost of production.

From the job summary of the cost system records find the cost of the mechanical production of the paper including the folding, either hand or machine, addressing, wrapping and taking to the postoffice. The cost of wrapping paper, paste and twine should not be charged against the newspaper as these are included in the hour costs of the bindery as direct department expense.

The totaling of these items of cost gives the production cost of each issue of the newspaper. As previously stated, the subscribers have never paid their just share of the production cost of the newspaper and in that lies the kernel of this method of finding the cost of advertising.

Having found the production cost of the issue, carefully measure up the number of column inches of display advertising in the paper. Divide this by the total number of column inches in the issue which will give the percentage of display advertising in that issue.

As an example:—There are in an 8-page 6-column paper 960 column inches of printed matter and of this amount there are 576 inches of display advertising, or 60 per cent of the space in that issue.

$$576 \div 960 = 60\%$$

To find the cost of the display advertising per inch, figure 60 per cent of the total cost of the issue and divide it by the 576 inches. This gives the production cost of an inch of display advertising.

Readers, legals and classified advertising are usually sold at a special rate, quite different and more than the rate for display. To find the cost of production of this advertising, take the remaining 40 per cent of the cost of the issue and divide it by the 40 per cent of the space. In the example given this would be 384 column inches. This result is the cost per column inch of the reading matter including these special classes of advertising. It is then only necessary to multiply the number of inches of each class of this advertising by the cost per inch to obtain the cost of each. Having the cost per inch it is an easy matter to ascertain the cost per advertisement, inch, square, folio, or line, as may be desired.

From the above data it is easy to determine what the subscription rate should be for the newspaper. Total the cost of all classes of advertising; deduct that amount from the production cost of that issue. This leaves the

cost of the reading matter. If this issue is a fair average in its proportion of advertising and reading matter it is only necessary to multiply this amount by 52, add any subscription profit deemed expedient and divide this total by the average number of paid subscriptions. This procedure will show about what the subscription rate should properly be.

The above method of finding the cost of advertising is logical and fair to the advertiser, the subscriber and the publisher. With this method advertisements not changed in each issue automatically care for themselves as the cost of such change will appear in the cost of the issue in which such change is made.

Remember that this method gives advertising costs and not selling prices and that, under modern conditions, a profit of not less than 25 per cent should be added to these costs.

COMMERCIAL INVESTMENT

QUESTION—*I do not believe that accounts payable should be deducted from the items of commercial investment or working capital. Money owned by a business will be represented, in one of four items, viz.:—plant investment, accounts receivable, work in process or merchandise. A condition is conceivable where the amount owed would exceed the total of the last three and a considerable portion of the first one, but that would not indicate that the capital was not there, and so not to be charged with interest. It merely indicates that the ownership of the business does not rest with the ostensible proprietor, but that his creditors' capital is being used to run the business. Most assuredly, he will be paying interest directly or indirectly, and the business must earn it, so that the whole capital involved without regard to liability should bear interest as part of the expense of doing business.*

S. E.

ANSWER—I heartily agree with you, but some printers with super-sensitive minds and afflicted with a mania to protect everyone but themselves and their families, want to be "honest," and hence figure out accounts pay-

140 HOW TO FIGURE COSTS

able. I believe they should not be deducted, and for the reasons that you state.

SELLING HOUR COSTS

QUESTION—As the extension rates are used for the purpose of distributing or apportioning selling expense, which in turn, is computed on the basis of sales, should not they conform to the selling value of the chargeable hours as nearly as possible, particularly where differing rates of profit are computed on the various operations, or on merchandise, it being, of course, understood that the merchandise entering into the completed product bears its proper apportionment of the selling expense.

A. E.

ANSWER—A great deal depends upon the method employed in figuring cost and selling price of finished jobs. If a definite selling price per hour is used, that amount should be used as an extension rate. If, on the other hand, the hour cost plus a profit by some fixed per cent on the total cost is used, then that hour rate should be the extension rate. It is all a matter of method, and either would be perfectly correct. The merchandise proposition is answered elsewhere.

INDEX

- Absorption of power by shafting, 69
- Accountants' method, 1
- Adjustment of rents, 16
- Administration expense, 105
- Advertising cost, 134
- Advertising and traveling expense, 99
- All floor space of equal value, 17
- All wages charged to centers, 3
- American Printers Cost Commission, 118
- Answers to questions, 123
- Appraised values of plant, 29
- Argument and examples, 114, 116, 119
- Artificial light sometimes a general expense, 74
- Bad accounts, discounts, 100
- Basis of distribution of charges, 54
- Being a good fellow, 101
- Benedict, Geo. and his Calculator, 124, 125, 126, 127, 128
- Bindery expenses, 81; inventory, 28
- Boss's salary, 106
- Building expense 13; interest, 15
- Building owned by plant owners, 13; rental consideration, location, etc, 13, 14
- Burden distribution, 53
- Capital equipment, 47
- Carrying customers, 108
- Cause of inefficiency, 25
- Charities, donations, dues, 100
- Commercial investment, 105, 139
- Composing room inventory, 27
- Composition expenses, 80
- Copyrights—no interest on, 48
- Cost of advertising, 134; of supervision, 131; per column inch in newspaper, 136
- Departmental payroll, 7, 8, 9
- Department productive center, 2; time summary blank, 4, 6
- Denham, Robert F., 80
- Depreciation on buildings, 15
- Depreciation table, 39
- Details of selling expense, 97
- Direct department expense, 79
- Directing foreman, 89
- Discounts, deductions, bad accounts, 100
- Distributing power, 57
- Distribution office expense, 115; selling expense, 102
- Donations, charities, dues, 100
- Efficiency costs, 3
- Efficiency of the workmen, 2
- Efficient men need less supervision, 2
- Elevator expense distribution, 77
- Example of cost of eight-page, six-column newspaper, 136
- Examples, interest on investment, 51; replacements, 41, 42, 43
- Expense of doing business, 105
- Expenses surrounding bindery, 81; composing room, 80; press room, 80
- Expense to be charged direct, 80

- Few printers know plant values, 26
- Figuring building expense, 13; interest, 45; inventory, 25; light, toilet and elevator expense, 71; replacement values, 37
- Finding floor space cost per unit, 23; horse power hour cost, 61
- Floor space, 13; diagram, 19; in terms of units, 21
- Foremen's salaries, 89
- Gasoline or steam engine cost, 62
- General plant, newspaper, 132
- Good fellow, being a, 101
- Goodwill, no interest on, 48
- Handling stock costs, 85
- Heat, janitors, repairs, 22
- Horse power divisions, 67
- How to treat spoiled work, 81, 82
- Importance of machinery values, 26
- Inch or column cost, 137
- Individual motors, 60; time summary blank, 6
- Insurance, taxes, 52
- Interest and depreciation on buildings, 15
- Interest on borrowed money, 107; on investment, 45; on own money, 107; rates of, 49
- Inventory blank, 30; valuation, 28
- Invested money must earn interest, 25
- Investment, insurance, taxes—interest on, 45
- Items in selling expense, 97
- Janitor service, heat, etc, 22
- Keep plant young, 38
- Labor cost—how arrived at, 7
- Layout of plant, 19, 59
- Light, toilet, elevator expense, 71
- Loading, artificial light, 74
- Location of front office, 16
- Low margin of profit, 50
- Machine on light circuit, 64
- Machinery and material listed in productive centers, 26
- Man working in several centers, 5; blank to fit such cases, 4
- Marketable values of plant, 28
- Minnesota Editorial Association, 134
- Money invested in stock, 109; tied up in work on hand, 109
- Neglect may mean failure, 108
- Newspaper—advertising, cost, subscriptions, 133, 136, 138
- Newspaper and job plant, 132
- Newspaper treated as an outside job, 135
- Non-producers, 90
- Obsolete machinery, 25
- Office expenses, 113; expense burden, 119
- Office inventory, 27
- Organization dues, charities, 100
- Outside work, 130
- Payroll and payroll hours, 120, 121
- Percentage non-chargeable time, 9
- Perpetual inventory, 109
- Plant investment expense, 49; layout, 59; never depreciates to zero, 38

- Present cost values of plant, 29
- Press costs too low, 129
- Pressroom expenses, 80; inventory, 27
- Printer as a landlord, 14, 15
- Private power plant, 68
- Production center method, 1; centers and floor space, 20
- Questions, on administrative expense, 111; on direct expense, 87; on floor space, 24; on foremen and superintendents, 95; on interest, insurance, etc., 55; on inventory, 35; on light, toilet and elevator expenses, 78; on office expense and sold hours, 122; on payroll, 11; on power, 70; on replacements, 44; on selling expense, 104
- Rent, heat, janitor, repairs, 23
- Replacement and depreciation differentiated, 38
- Replacement values, 37, 43
- Risk in printing plants, 50
- Run-down machinery and material, 25
- Sad commentary on business printers, 93
- Salaries and commissions to salesmen, 98; of foremen and superintendents, 89
- Salary of "the boss," 106
- Scrapped machinery checked off, 32
- Selling expense, 97; distribution of, 102
- Selling hour costs, 140
- Shafting and belting, 69
- Spoilage and stock handling expense, 79
- Spoiled work expense, 81; a fixed sum, 83
- Standard method, the, 118
- Stock handling by weight, 86; storage and handling, 84
- Strict account of dollars, lax account of time, 93
- Subscription rates for newspaper, 138
- Summary of costs, 112
- Superintendence problem, 131
- Superintendents' salaries, 89
- Taxes, insurance, improvements, etc., on buildings, 15
- Telephone, telegram, toll, 101
- Ten percent for stock handling, 85
- Three primary productive centers, 26
- Time summary blank, 4, 6
- Toilet expense distribution, 76
- Total cost and office cost, 117
- Traveling expense and advertising, 99
- Two depreciation plans, 39
- Type salesman as appraiser, 31, 33
- Units of floor space, 21
- Usual productive centers, 3
- Wages plus overhead, 124
- Waste, spoilage, loss, 84
- Working balance, 107; capital and investment, 45; greater than equipment investment, 48
- Working foreman, 89
- Work in process, 46, 47



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